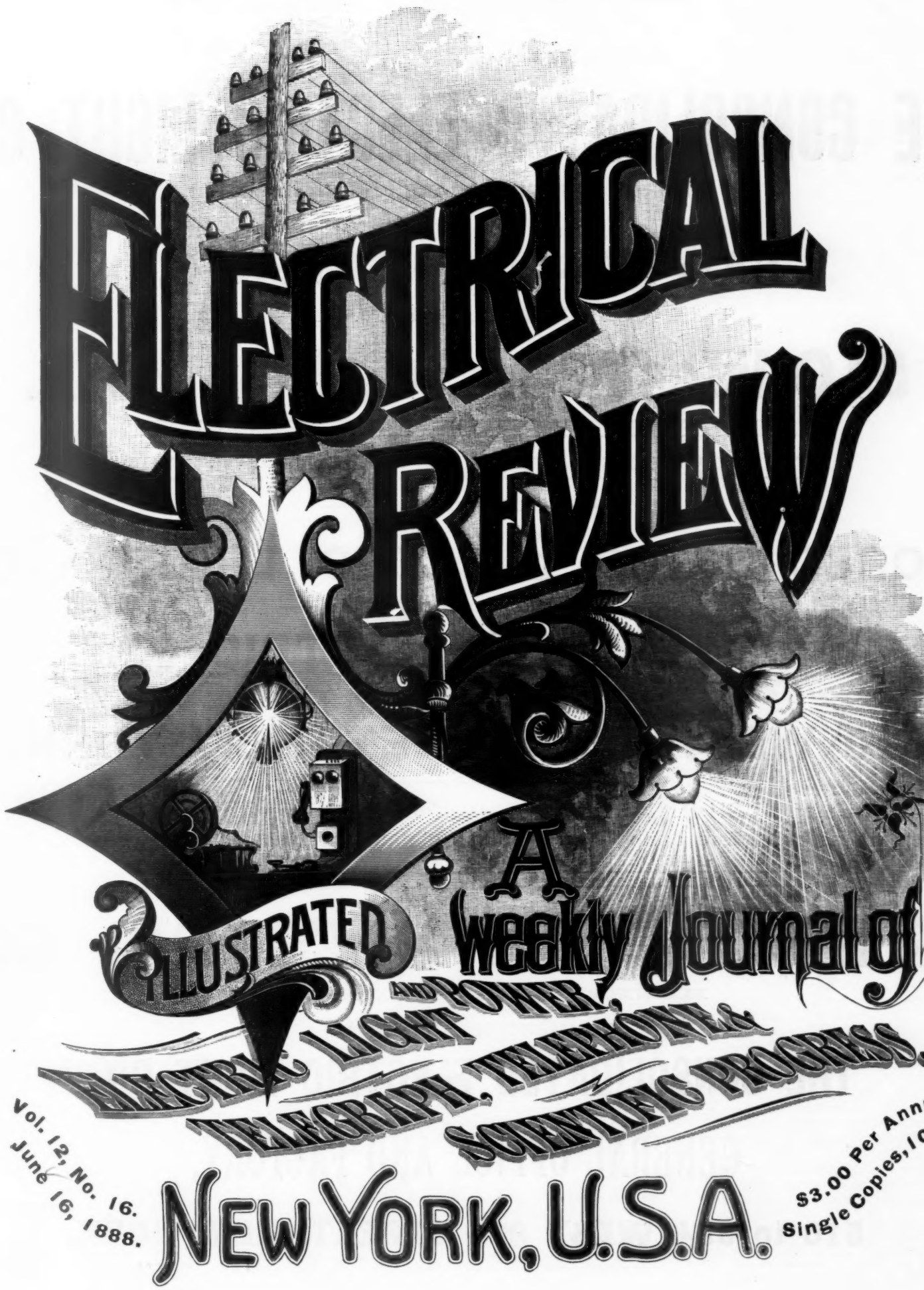
ELECTRICAL
REVIEW
ILLUSTRATED
A weekly Journal of
ELECTRIC LIGHT AND POWER,
TELEGRAPH, TELEPHONE &
SCIENTIFIC PROGRESS.
Vol. 12, No. 16.
June 16, 1888.
NEW YORK, U.S.A.
$3.00 Per Annum.
Single Copies, 10 Cts.

THE CONSOLIDATED ELECTRIC LIGHT CO.

GEORGE WESTINGHOUSE, Jr., President,

OWNERS OF THE

SAWYER-MAN PATENTS,

GENERAL OFFICE:

510 West 23d St., New York.

THE GENERAL OFFICES

—— OF THE ——

Consolidated Electric Light Co.,

—— AND OF THE ——

SAWYER-MAN ELECTRIC CO.,

ARE REMOVED TO

510 WEST 23d STREET, NEW YORK.

The Office of HUGH R. GARDEN, Vice-President and General Counsel of the Company, will remain as heretofore at the Mutual Life Building, 32 Nassau Street.

SAWYER-MAN ELECTRIC CO.

HENRY C. DAVIS, President,

COMMERCIAL AGENTS OF

THE CONSOLIDATED ELECTRIC LIGHT CO.,

GENERAL OFFICE AND FACTORY,

510 to 534 WEST 23d STREET, NEW YORK.

ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 12, No. 16. WEEKLY. | NEW YORK, SATURDAY, JUNE 16, 1888. | $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

The Eco Magneto Clock.

The Eco Magneto Watchman's Clock is a new invention which we illustrate in the present issue. Many electric watchmen's clocks now in the market are rendered impracticable for use, or their usefulness is impaired, by their complicated structure and liability to disarrangement. The Eco clock is simple in construction, not liable to get out of order and cannot be tampered with. It is also easily put in position and can be set up and run by a person unfamiliar with electricity. All previous clocks of this kind have been worked by a battery, but a new idea in this connection, introduced here for the first time, is to generate the current which operates the dial punch by a permanent magnet which the watchman operates at each station. Like other clocks, its record shows the exact time the watchman visits each station; and also, when required, a bell in the house of the owner or superintendent of the property is connected with the clock, and rings automatically when the watchman neglects his duty.

The magneto which generates the electricity at each station is a small one similar in principle to a telephone call, except that but one-quarter of a turn is necessary to make a record. Gravity is made use of as far as possible in the operation of the dial punch. A fact which certainly speaks well for the clock is that the Associated Factory Mutual Insurance Companies, after thorough examination and tests, adopt it in their circular report No. 22. The Eco clock is a Boston invention and the company there have recently taken enlarged offices and are doing a good business in its manufacture and sale.

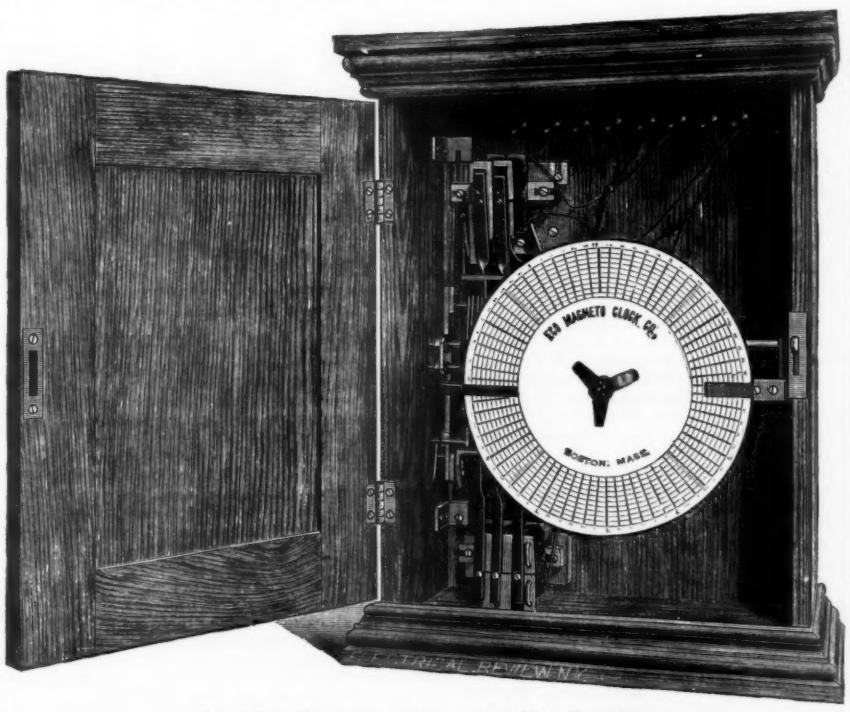
A Telegraph Pioneer.

The London *Standard*, in an article on the death of Sir Charles Bright, one of the pioneers of electric telegraphy, says:

"Bright had been contemplating a cable across the Atlantic. In 1853 he had laid one between England and Ireland, and in 1856, with this purpose in view, he formed an agreement with Cyrus Field and Dr. Whitehouse on one side, and the Brothers Brett, who had been so active in laying the Channel line, on the other. He himself undertook the engineering part of the enterprise, and, as all the world knows, after three attempts eventually succeeded, though the complete success of the Atlantic telegraph was not until eight years later, owing to the faulty insulation of the first wire. Since that date many cables have been laid by Sir Charles Bright. India was brought into communication with Europe by one; the United States and Cuba by another, and most parts of the coast-lying portions of America connected by the others which he was almost constantly engaged in constructing. But though the gulf between the New World and the Old has, since the year 1858, been spanned and respanned, until a message from one side to the other is thought of so little account that during the recent snowstorm, when local lines were stopped, telegrams were actually sent from Boston to Ireland and thence retransmitted to New York, no other enterprise of Sir Charles Bright can be compared in romantic interest to the one with which his fame is so especially connected. When other men were declaring the schemes in which he afterward took part impracticable, he never lost heart. His first cable was broken twice, his second was a failure owing to a violent storm, and his third ceased to transmit signals after a brief period of electrical activity. But when even Cyrus Field was in doubt whether, as the American poet has it, he would ever get more 'than half seas over,' and the American capitalists had begun to construct a line through Siberia, Bright was confident that the end had not yet come. It is not the least of the many claims he has on his countrymen that he kept their spirits up when more desponding advisers would have reduced them to zero."

Some Uses for the Phonograph.

Now that Edison's phonographs are cheap, the Baltimore *American* suggests that persons who have "fool friends" that never stop talking persuade these bores to use talking machines, pour their surplus oratory into them, and then let their acquaintances grind out the conversation as it suited their convenience. A better plan would be, after compelling one of these perpetual talkers to load up his phonograph, to let the afflicted turn the crank and oblige the conversationalist to listen. He would thus get a dose of his own concoction, which the man at the crank could repeat until the desired effect was produced. A complete cure would doubtless result from the treatment in a very few days.



THE NEW MAGNETO CLOCK OF THE ECO COMPANY.

—— The Mayor of Buffalo sends a report to the Council, to the effect that the total number of telegraph and telephone poles in the city, as enumerated by the police, was 7,849; total number of electric light poles bearing wires only, 2,855; total number of electric light poles bearing lights, 833; grand total, 11,537. The Mayor recommended that the companies be proceeded against by mandamus, to compel them to place the wires underground.

Progress of Electrical Science.

Professor Elisha Gray, in a lecture preceding a series of interesting electrical experiments given at Evaston, Ill., on the 10th of May, said, among other things too good to omit, but which for lack of room must be deferred, that those of us who are just crossing the meridian of life can well remember the first telegraph wire that was strung in this country. To-day it is difficult to find a corner of the earth so remote as to be out of sight of one. You will find them even in the bottom of the seas and oceans. The last twenty years have seen more advance in the science of electricity than all the 6,000 historic years preceding. More is discovered in one day now than in a thousand years of the middle ages, so that, literally, "a day is a thousand years." We put it to all sorts of uses. We make it carry our messages, drive our engine, ring our door bell, and scare the burglar.

We take it as a medicine, light our gas, see by it, hear from it, talk with it, and now we are beginning to teach it to write. If Job lived in this age, and the question were put to him as of old, "Canst thou send lightnings, that they may go and say unto thee, 'Here we are'?" he could say, "Yes;" and they can be made to say it in the vernacular. A friend of mine says in verse:

Time was when one must hold his ear
Close to a whispering voice to hear—
Like deaf men, nigh and nigher;
But now from town to town he talks,
And puts his nose into a box
And whispers through a wire.

In olden times along the street
A glimmering lantern led our feet
When on a midnight stroll;
But now we snatch, when night comes nigh,
A piece of lightning from the sky
And stick it on a pole.

The question naturally arises in contemplating this subject, "What is it?" I can imagine the last man on the last day asking this same question, "*What is it?*" At one time, not long ago, it was supposed to be a fluid; by some two fluids—a positive and a negative. But in this day there are few who do not believe it to be simply a mode of motion; not matter, but a condition of matter; and not a mechanical, but a molecular motion. By mechanical motion is meant a motion of the mass, and by molecular motion is meant a motion of the ultimate particles of which the mass is made up.

The Critical Temperatures of Iron.

In a brief review the author touches on the results previously obtained as a sort of preliminary to his own experiments, an account of which are given in the following abstract.

According to Mr. Becquerel, the magnetic properties of iron cease to exist at a dull red heat. Nickel and cobalt are subject to a similar phenomenon; and in the case of nickel, Mr. Benson has fixed the critical temperature at 336° C.

Mr. Pionchon has made a thorough investigation of the specific heat of iron at various temperatures, and gives the following values:

From 0° to 660° S=0.11012+0.0000·066t+0.0000001641t^2
" 660° " 720° S=0.57803 − 0.002872t + 0.0000035854t^2
" 720° " 1000° S=0.218
" 1050° " 1200° S=0.19887

Moreover, there is a change of state between 660° and 720°, with an absorption of 5.3 calories as latent heat; and a second change of state between 1,000° and 1,050°, with an absorption of 6 calories.

The thermo-electric properties of iron have been the subject of special investigation by Mr. Tait. The irregularities noticed in the behavior of iron may be traced to the above-mentioned changes of state. The line representing the thermo-electric power of iron, as compared with lead, for example, is not a regular curve, but shows two sharp bends corresponding to the two critical temperatures. Nickel behaves in a similar way, but the critical temperatures are much lower, between 200° and 400°.

A curious phenomenon has been noticed in the expansion of iron, by Mr. Gore and Mr. Barrett. When an iron wire which has been heated to a bright red heat is allowed to cool gradually, it shortens; but at one point in the dull red it suddenly lengthens again momentarily; the reverse phenomenon, viz. a shortening on heating, may also be noticed by the aid of sufficiently delicate apparatus. If the experiment be performed in the dark, a momentary increase of brightness is noted at the same instant; this is the so-called recalescence of iron.

The only observation on the resistance of iron wires at various temperatures is one by Mr. Macfarlane, who noticed a change at a dull red heat.

The effects of torsion have been minutely studied by Mr. Tomlinson, who concludes that there are two critical temperatures, one at a dull red heat, and the other at a higher temperature near the bright red. The iron loses its magnetic properties at the former.

The same two temperatures, *i. e.*, about 700° and 1,000°, seem also, according to Mr. Moissan, to have very curious effects on the allotropic modification of the oxide of iron.

—— The St. Louis, Mo., Exposition building, in which the Democratic National Convention was held, was amply lighted by electric lamps, and produced a very brilliant and striking effect on the spectators.

The Patent Work of the National Electric Light Association.

We publish below the letters of endorsement recently received by the Legal Department of the National Electric Light Association, relative to the bill proposed by the Association for the creation of a Court of Patent Appeals, now pending in the House of Representatives. The bill as amended by Mr. Justice Miller and Mr. Justice Bradley, who have given it careful attention, is also published, and will be of interest to all our readers having business with the patent office, or any interest in patents.

OPINION OF THE SUPREME COURT OF THE UNITED STATES.

SUPREME COURT OF THE UNITED STATES.
WASHINGTON, May 25th, 1888.

HON. GEO. TICKNOR CURTIS,

My Dear Sir: It gives me pleasure to say that after going over the Bill of the H. of R. No. 9084, to establish a Court of Patent Appeals, and making a few suggestions which you accepted, I approve of the Bill entirely. It will do much to relieve the over-burdened docket of our Supreme Court, in a direction where it can best be done.

Although the Bill has been submitted to no distinct vote of the members of the Court, it has been considered by them all, and I feel sure that I express their concurrent opinion when I say that they all desire the passage of the Bill, and will be much gratified if it shall become a law.

I am very truly yours,
SAM'L F. MILLER.

OPINION OF MR. JUSTICE BRADLEY.

WASHINGTON, April 9th, 1888.

ARTHUR STEUART, ESQ.,

Dear Sir: Your Bill (H. R. 9084), would make a great improvement in this department of Judicial procedure.

Very truly yours,
JOSEPH P. BRADLEY.

LETTER FROM THE LATE CHIEF JUSTICE WAITE.

WASHINGTON, March 16th, 1888.

My Dear MR. CURTIS: I have read carefully your letter to Mr. Gorman, a copy of which some one has been good enough to send me, and agree with you cordially in all your suggestions, but especially that which relates to the finding of facts by the Court of Patent Appeals. There is no more reason why the facts should come before us in this class of cases after the trials below, than there is in cases of admiralty.

Sincerely yours,
M. R. WAITE.

OPINION OF THE COMMISSIONER OF PATENTS.

U. S. PATENT OFFICE, May 26th, 1888.

ARTHUR STEUART, ESQ., Baltimore, Md.

Dear SIR: I have considered the Bill, H. R. 9084, with amendments suggested before sub-committee of Judiciary Committee of the House, and am convinced that it meets the urgent requirements of the present situation. It will tend directly and immediately to relieve the Supreme Court of its enormously overgrown docket, and to abolish the delays in the administration of law which now almost amount to a denial of justice. The patent laws in their application must be applied by expert tribunals. The Patent Office is an expert in the arts. It is required to be such, not only by the nature of its duties, but by the principles of its organization. It is impossible that judicial tribunals can properly and safely revise and review its work, and adjudge the rights of the public and of individuals arising from its operations, without possessing an element of the knowledge and familiarity of the expert that lies at the foundation of the whole system.

I sincerely trust Congress can be induced to give the subject the consideration it is worthy of.

Yours very truly,
BENTON J. HALL,
Commissioner of Patents.

OPINION OF THE BAR.

WASHINGTON, D. C., May 22, 1888.

The Patent Bar Association of the District of Columbia is strongly in favor of a Court of Patent Appeals, such as is proposed by Bill H. R. 9084. We are clearly of the opinion that such a court would be of vast importance.

First: by securing a far more uniform practice in the granting of patents, by which there would be less invalid patents granted, and the capital invested in patents and business enterprises based upon patents would be rendered more secure.

Second: It would lessen litigation, and what is equally, if not more important, it would enable patent cases to be decided in much less time.

Third: It would relieve the Supreme Court, for very few cases would ever go beyond the proposed court.

Fourth: It would put an end to the conflicting decisions which is one of the great troubles of the day.

W. C. DODGE,
President Patent Bar Association.

THE BILL TO ESTABLISH A COURT OF PATENT APPEALS.

[50th Congress, 1st Session, H. R. 9084.]

IN THE HOUSE OF REPRESENTATIVES.

APRIL 2, 1888.

Read twice, referred to the Committee on the Judiciary and ordered to be printed.

MR. RAYNOR introduced the following bill:

A BILL

To establish a Court of Patent Appeals of the United States.

Be it enacted by the Senate and House of Representatives in Congress assembled:

SEC. 1. There shall be a Court of Patent Appeals of the United States, which shall consist of a Chief Justice and four Associate Justices, who shall be appointed by the President, by and with the advice and consent of the Senate, and who shall hold office during good behavior. Any three of said Justices shall constitute a quorum.

SEC. 2. The Associate Justices shall take precedents according to the dates of their commission, or when the date of the commission of two or more of them is the same, according to their ages.

SEC. 3. In case of a vacancy in the office of Chief Justice, or of his inability to perform the duties and powers of his office, they shall devolve upon the Associate Justice, who is first in precedent, until such disability is removed, or another Chief Justice is appointed and

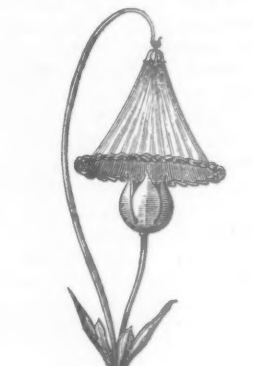


FIG. 1.—ELECTRIC TABLE LAMP.

duly qualified. This provision shall apply to every associate justice who succeeds to the office of Chief Justice.

SEC. 4. The justices of the Court of Patent Appeals shall receive the sum of eight thousand dollars each per annum, to be paid monthly.

SEC. 5. The Court of Patent Appeals shall have power to appoint a clerk and a marshal for said court, and a reporter of its decisions.

SEC. 6. One or more deputies to the clerk of the Court of Patent Appeals may be appointed by the court on application of the clerk, and may be removed at the pleasure of the court. In the case of the death of the clerk, his deputy or deputies, shall, unless removed, continue in office and perform the duties of the clerk in his name until a clerk is appointed and qualified; and for the default or misfeasance in office of any such deputy, whether in the life-time of the clerk or after his death, the clerk and his estate and the sureties on his official bond shall be liable, and his executors and administrators shall have such remedy for such default or misfeasance committed after his death, as the clerk would be entitled to if the same had occurred during his life-time. The fees of the clerk shall be the same as those of the clerk of the Supreme Court for like services, but shall not exceed six thousand dollars per annum; the residue to be accounted for to the treasury of the United States. The salaries of the deputy clerks shall be fixed by the court, in no case to exceed twenty-four hundred dollars per annum.

SEC. 7. The marshal shall be entitled to receive a salary at the rate of two thousand dollars a year. He shall attend the court at its sessions, shall serve and execute all process and orders issuing from it, or made by the chief justice or an associate justice in pursuance of law, and shall take charge of all the property of the United States used by the court or its members. With the approval of the chief justice he may appoint assistants and messengers to attend the court, with the compensation allowed to officers of the House of Representatives of similar grade.

SEC. 8. The reporter shall cause the decisions of the Court of Patent Appeals, made during his office to be printed and published within six months after they are made, and within the same time, shall deliver three hundred copies of the volumes of said report to the Attorney-General. And he shall, in any year when he is so directed by the court, cause to be printed and published a second volume of said decisions, of which he shall deliver in like manner and time, three hundred copies.

SEC. 9. The reporter shall be entitled to receive from the treasury an annual salary of twenty-five hundred dollars, when his report of said decisions constitutes one volume, and an additional sum of fifteen hundred dollars when, by direction of the court, he causes to be printed and published in any year a second volume. But said salary and compensation respectively shall be paid only when he causes such decisions to be printed, published and delivered within the time and in the manner prescribed by law, and upon the conditions that the volumes of said report shall be sold by him to the public for a price not exceeding four dollars a volume.

SEC. 10. The three hundred copies of the reports of the Court of Prtent Appeals shall be distributed by the Attorney-General, as follows: To the Commissioner of Patents forty copies, and the balance as provided in the section 683 of the Revised Statutes for the distribution of the Supreme Court reports.

SEC. 11. The Court of Patent Appeals shall hold at the seat of government one term annually commencing on the second Monday in October, and such adjourned or special term as it may find necessary for the dispatch of business.

SEC. 12. If at any session of the Court of Patent Appeals a quorum does not attend on the day appointed for holding it, the justices who do attend may adjourn the court from day to day for twenty days after said appointed time, unless there be sooner a quorum. If a quorum does not attend with-

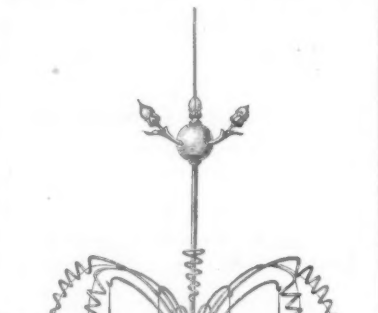


FIG. 2.—ELECTKIC FIXTURE.

in said twenty days, the business of the court shall be continued over until the next appointed session; and if during a term, after a quorum has assembled, less than that number attend on any day, the justices attending may adjourn the court from day to day until there is a quorum, or may adjourn without day.

SEC. 13. The justices attending at any term when less than a quorum is present, may, within twenty days mentioned in the preceding section, make all necessary orders touching any suit, proceeding or process, depending in or returned to the court, preparatory to the hearing, trial or decision thereof.

SEC. 14. The Court of Patent Appeals of the United States shall have appellate jurisdiction in the cases hereafter specially provided for without regard to the sum in controversy.

1st. "From the courts of the United States having original jurisdiction of cases touching patents, copyrights, trade-marks and labels, in all cases involving these subjects."

2d. From the Commissioner of Patents in all cases touching the patentability of inventions, priority of invention among several claimants for patent upon the same invention, and in all cases of re-issue and the judicial practice of the Patent Office, also all cases touching the registration of trade-marks or labels and the rights of conflicting claimants therefor.

SEC. 15. From and after the passage of this Act, there shall be no appeal from the Circuit Courts of the United States or any territorial or district court or Court of the District of Columbia, in cases touching patents, trade-marks, copyrights or labels, to the Supreme Court of the United States directly, but all such cases formerly appealable to the Supreme Court shall be heard on appeal by the Court of Patent Appeals.

SEC. 16. There shall be a right of appeal from the Court of Patent Appeals to the Supreme Court of the United States in all cases, regardless of the amount in controvesy; subject to the same regulations, however, as now exist with regard to appeals to the Supreme Court in causes of admiralty and maritime jurisdiction, and to such further regulations as the Supreme Court of the United States may make.

SEC. 17. All cases touching patents, trade marks, copyrights or labels, now pending before the Supreme Court of the United States awaiting trial, shall be transferred to, and heard by, the Court of Patent Appeals.

SEC. 18. When any judge of the Court of Patent Appeals resigns his office after having held his commission as such at least ten years, or who has held his commission as such for not less than five years, having previously held a commission as a judge of Circuit or District Court of the United States for a period sufficiently long to make up ten years' service as a judge of a United States Court, and having attained the age of seventy years, he shall, during the residue of his natural life, receive the same salary which was by law payable to him at the time of his resignation.

SEC. 19. Section four thousand nine hundred and eleven of the Revised Statutes shall be, and hereby is amended so as to read as follows: If such party is dissatisfied with the decision of the commission he may appeal to the Court of Patent Appeals of the United States.

SEC. 20. Section four thousand nine hundred and twelve of the Revised Statutes shall be, and hereby is amended so as to read as follows: When an appeal is taken to the Court of Patent Appeals the appellatee shall give notice thereof to the commissioner, and file in the Patent Office, within such time as the commissioner shall appoint, his reasons of appeal specifically set forth in writing.

SEC. 21. That section forty-nine hundred and fifteen of the Revised Statutes of the United States is hereby repealed.

SEC. 22. That section seven hundred and eighty of the Revised Statutes, relating to the District of Columbia, is hereby repealed.

SEC. 23. All Acts or parts of Acts inconsistent with the provisions of this Act, are hereby amended so as to be consistent therewith.

Artistic Fittings.

Two new designs in electric light fixtures are illustrated in this issue. In electric lighting a great variety of fixtures can be used. The two shown are from the show rooms of Messrs. Laing, Wharton & Downs, London.

Fig. 1 shows an elegant table lamp, carrying a shade of silk of any color. Of course, it is easy to arrange for the contacts in these table lamps, either by means of flexible wires, or, if the lamp is ordinarily required in one particular place, by means of a conducting contact through the table.

Fig. 2 shows a light electrolier for a moderately-sized room. It is generally believed that it is the design of such electroliers which permits the greatest display of artistic taste, though some unbelievers maintain the contrary, and that the greatest difficulty of the designer is met with when he has to design a solitary lamp fitting, and keep the cost down to a minimum. Still, business men have to consider what pays best, and undoubtedly they have a greater latitude allowed them when making a large electrolier than with the single fitting. The cost compared with the cost of gas fittings will always be in favor of the electric light.

Manufacturing Notes.

Mr. Wm. A. Doty has opened an electrical house at 727 Filbert street, Philadelphia, and will deal in general electrical supplies. He will make a specialty of experimental and repair work.

J. E. Jeffords & Co., Philadelphia, are the well known manufacturers of porous cells, and find their business increasing continually, as a result of the growing trade in batteries. They are large manufacturers.

Messrs. Shaw & Geary, Philadelphia, have on exhibition in their office, an engine made entirely of glass and run by a battery, the electric motor forming part of the engine. It is an interesting and beautiful design.

The Novelty Electrical Works, Philadelphia, have moved into more convenient and commodious quarters at No. 54 North Fourth street, the increase in business demanding these increased facilities. Mr. C. E. Trump, the wide-awake manager, has built up a fine business and is to be congratulated on the pleasant office conveniences recently secured.

Mr. Jarvis B. Edson, of 145 Broadway and 86 Liberty street, has just issued a neatly printed catalogue of his pressure-recording guage, also his time and speed recorder. The popularity of these valuable practical inventions is shown in the long list of users, the list, however, comprising but a small portion of the patrons. The pamphlet, which contains instructions regarding the use of the gauges, will be sent to applicants interested in work of this nature.

Hudson, N. Y.—The Hudson Electric Railway Company. Capital, $50,000. Hiram McGonigal, and others, incorporators.

New York.—The Manhattan Electric Light Company, of New York, filed articles of incorporation with a capital of $50,000.

Kansas City, Mo.—The Electric Line Company has been incorporated. Capital, $10,000. L. H. Holmes, and others, incorporators.

Park Manor, Ill.—The South Side Electric Lighting Company has been incorporated. Capital, $100,000. Lieman Allen, and others, incorporators.

Ellensburg, W. T.—Ellensburg and Columbia Telegraph Company; capital stock, $25,000; T. L. Mixon, L. E. Post, T. L. Stiles, incorporators.

Gainesville, Ga.—The Gainesville Light Company; capital stock, $20,000; incorporators, S. C. Dunlap, J. W. Smith and E. H. Jewell, all of Gainesville.

Salem, Ohio.—The Salem Fuel, Gas and Electric Light and Power Company has been incorporated. Capital, $200,000. J. T. Brooks, and others, incorporators.

Colfax, W. T.—Colfax Electric Light Co.; capital stock, $12,000. Jas. A. Perkins, prest.; F. Brown, vice-prest.; A. Coolidge, treas.; C. B. Hopkins, secy. and general manager.

Winchester, Ky.—The Winchester Electric Light and Power Company; capital stock, $15,000; incorporators, J. D. Simpson, S. D. Kerr, A. H. Hampton, A. Stewart and others.

San Bernardino, Cal.—San Bernardino and Colton Electric Railroad. Stock $30,000. Incorporators F. D. French, O. S. Emery, W. L. Burton of Colton, F. M. Clark, M. Entler, of Los Angeles.

Chicago, Ill.—The Western Light and Power Company, of Chicago; capital, $100,000; to furnish electric light and power. Incorporators, Wm. M. Talcott, Carlton Prouty and Frank Ives.

Camden, N. J.—The Electric Storage Battery Company. Capital stock, $10,000,000, with $2,500 paid in. The incorporators are Waldron Shapleigh, Samuel T. Bodine and Randall Morgan, of Philadelphia.

Rockaway, N. Y.—The Thompson-Houston Electric Light and Power Company, of Rockaway, capital $75,000. Frank P. Slade, Brooklyn; Dorwin A. Henry, New York, and John A. Moor, Springfield, Mass.

Chicago, Ill.—The Champion Fire Proofing and Insulating Company, at Chicago; capital stock, $150,000; for the manufacture of fire proofing and insulating materials; incorporators, B. F. Voute, J. F. Marshall and S. Schupp.

Chicago, Ill—The Illinois Metal and Manufacturing Company, of Chicago; capital stock, $100,000; to manufacture metals, machinery and mechanical appliances; incorporators, John C. Jackson, Erhard Hardmeyer and Mark Campbell.

Council Bluffs, Iowa.—Articles of incorporation of the Ogden iron works company, were filed with County Recorder. Capital stock, $50,000. The incorporators are Ferris Ogden, Thomas Officer, George F. Wright, C. B. Waite and John P. Weaver.

Lincoln, Neb.—The Tecumseh Electric Light Company has been incorporated by A. M. Appleget, Charles Leach, G. C. Zutavern and Charles M. Headreck, each of whom have subscribed for twenty-five shares of stock. The capital stock is $10,000 in shares of $100 each.

New Haven, Conn.—The Denison Electric Company. Capital stock $3,000, divided into 120 shares of $25 each. The incorporators are W. A. Harris, Julian F. Denison, and Andrew R. Bradley. The company propose to design and sell motors, dynamos and other electric apparatus.

Bath, Me.—The Hoosic Falls Electric Light and Power Company; capital stock, $40,000; amount paid in, $300; per value of shares, $100. The stockholders are Frank A. Sawyer, Portland; James W. Wakefield and Fritz H. Twitchell, Bath. James W. Wakefield is president, Frank A. Sawyer, treasurer.

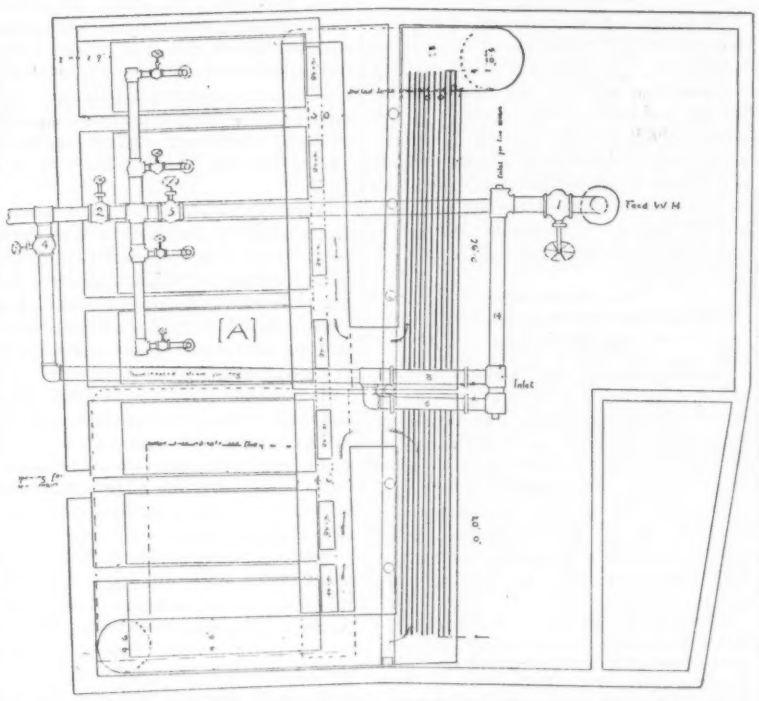


FIG. 1—PLAN VIEW OF PROPOSED STEAM PLANT OF ELECTRIC LIGHT STATION USING REHEATER.

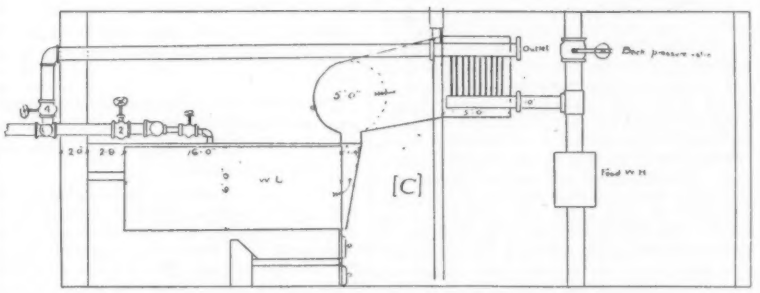


FIG. 2—SIDE ELEVATION OF SAME.

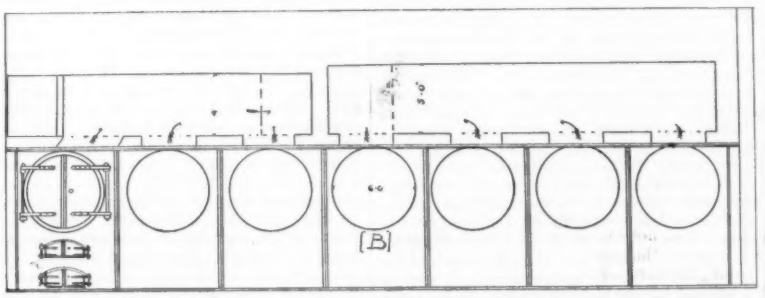


FIG. 3.—FRONT ELEVATION OF BOILERS.

Portland, Me.—The Enos Electric Systems Company. Capital stock $1,000,000; amount paid in $2,500; par value of shares $10. The stockholders are John A. Enos, Boston, Mass.; William C. Otis, Nahant, Mass.; Paul West and E. Herbert Ingalls, Brookline, Mass.; William E. Plummer, Newton, Mass. William C. Otis is president, William E. Plummer, treasurer.

Grand Rapids, Mich.—The Michigan Feed-Water Heater and Purifier Co.; capital, $100,000; stockholders are Samuel H. Burrell of St. Louis, Mo., John Widdicomb, James G. McBride, William Dunham, Charles R. Sligh, Ezra T. Nelson, Jay D. Utley, William A. Berkey, Elias Matter, W. H. Jones, of Grand Rapids. The purpose of the corporation to manufacture a new patented device for heating and purifying water for steam boilers and for the prevention and removal of scale.

—— The Thomson-Houston Company report the following new plants: Frederick, Md., 60 arcs: Madison, Wis., 30 arcs; Revere, Mass., 150 arcs, 500 incandescent; Reedsville, N. C., 50 arcs; Owego, N. Y., 35 arcs; Waterville, Maine, 500 incandescent; Medford, Mass., 500 incandescent; Potsdam, N. Y., 500 incandescent; Hyde Park, Mass., 50 arcs. And the following increases: Houghton, Mich., 30 arcs; Mankato, Minn., 30 arcs; Jacksonville, Ill., 30 arcs; Canton, Ill., 30 arcs; Crawfordsville, Ill., 70 arcs; Des Moines, Iowa, 70 arcs; Cambridge, Mass., 100 arcs; Salem, Mass., 400 incandescent.

The Hussey Reheater and Superheater.

The restlessness of the inventive faculty of the human mind is accountable for much of the wonderful progress of the mechanic arts. But once in a while the inventor has to pause. His process has reached a humanly perfect stage, but his activity must be satisfied; he must improve. So he goes back to the beginning of his process and finds new worlds to conquer in economizing and utilizing the wastes. This has been a prolific field of invention which has been cultivated to enormous advantage. A whole army of inventors, men of ability and keen judgment, have massed their efforts on the steam-engine, until to-day it may be said, to have reached its zenith—as a converter of heat energy into mechanical work. And yet its factor of efficiency seems miserably low. As Prof. R. H. Thurston says "only about 14 per cent. of the potential energy stored in the coal is, with the best efforts of the greatest engineers since Watt, utilized for the benefit of mankind." The steam-engine is however, on our starting hypothesis, capable of great improvement, by going back and attacking the wastes. The same authority goes on to say "on the other hand, the conversion of the ordinary steam-engine into a superheated-steam-engine would open the same possibilities in the direction of its improvement; and it is not impossible, though it seems now very improbable that it is in that direction, combining high temperatures with high pressures, that the steam-engine is to make its next great advance."

Here at once is the fingerboard of progress and it points in the direction of saving the wastes.

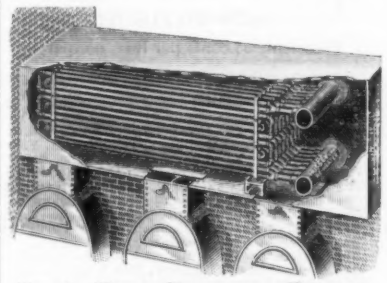


FIG. 4.—HUSSEY REHEATER IN POSITION.

The Hussey Reheater and Steam Plant Improvement Co., of 15 Cortlandt St., New York City, have taken a long stride on this new path. They have not only the means wherewith the steam engine can be converted into a superheated steam engine, but also the means of utilizing a large amount of the now waste energy potential in the coal, by revivifying the exhaust steam and using it as a source of revenue. Steam makers are a generally shrewd and wide-awake class of men, and nowhere more so than in the electric lighting companies, and when they have found that they can virtually insert nets into their exhaust pipes and smoke-stacks and gather dollars therein, they will not be slow to act. Yet this is precisely what the Hussey system assumes to do, by practically utilizing both the waste heat of the exhaust steam and that of the gases of combustion, and thus greatly increasing the net factor of conversion of the energy stored in the coal into useful work, without any added cost whatever for fuel.

There is no reason why every electric light company, centrally located in a city or town of any considerable size, should not be also a steam heating company; converting its now useless exhaust steam, by means of a system of re-heating, without additional fuel, into a valuable product which its neighbors requiring heat will be glad to buy, and during the warm season turn its reheating plant into a superheating plant and thus greatly increase the efficiency of total conversion from the coal-pile to the driving belt.

Figs. 1, 2 and 3 illustrate the proposed application of the Hussey system to a 1,000 horse-power central station lighting plant in a neighboring city now in operation and allowing good money to waste through its exhaust pipes and smoke stacks. Fig. 4 shows a Hussey reheater in position in the smoke box or omnibus flue which conveys all waste products of combustion of the stack.

During cool weather, when steam heat is saleable, the back pressure valve *is* closed, valve 1 open, valve 4 shut, and the exhaust steam passes through the reheater, becomes about 300° F., and is then delivered to the distributing pipes, and as it costs only the interest on the Hussey attachments, a large income is obtainable from what to-day is waste. During the hot weather, the exhaust pipe is open, valve 1 is closed, and the other valves are so manipulated as to compel the *live steam* to all pass through the reheater, and the waste heat now raises the temperature of the live steam to about 450° F., in which condition, at the engine, a saving over ordinary live steam of over 30 per cent. is effected in the item of pound-hours of steam per horse-power. When put in figures, the saving is so marked that the present waste seems like folly.

Examples of the use of the Hussey reheater, and of the results accomplished, may be found in the Welles Building, 18 Broadway, and in the Eagle Fire Ins. Co.'s Building, 71 Wall street, where the saving in fuel has been from 40 to 50 per cent. In the former the same work is now performed with two boilers, which formerly required four; and in the latter, one boiler is now doing the work that formerly required two; while in both instances the service is much more perfect and satisfactory than before.

ELECTRICAL REVIEW

Published at 13 Park Row

P. O. BOX 3329.

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REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.
TELEPHONE CALL, 546 JOHN.

SUBSCRIPTION.

United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.

Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.

Transient, 25 cents per line, nonpareil.

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Address all communications and make all Express Money orders, P. O. orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Timothy W. Sprague, Massachusetts Institute of Technology, is our representative at Boston, Mass.

Mr. C. C. Haskins, 118 La Salle Street, Chicago, Ill., represents the REVIEW in the West.

NEW YORK, JUNE 16, 1888.

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An interesting interview on the underground question, with Col. W. L. Strong, President of the Brush Electric Illuminating Company of New York, is published in another column.

An interesting column of Western telephone news will be found in our Chicago correspondence. It would seem that all is not peaceful in telephone circles in the great and growing West.

The mining interests have been rather slow in introducing electric power to aid in their work, but now it looks as if electricity would come into general use in the large mines of the country.

St. Louis is of the opinion that $50 a year is enough to pay for the use of a telephone in that city. As this would practically kill the telephone business there, many of the leading business men are opposed to this summary action of the council. They certainly would not fancy this summary wiping out of their individual industries. From all accounts we should think the city had made enough out of extortionate charges to Democratic convention delegates to satisfy it for a few years.

ELECTRIC MOTORS CREATING ENTHUSIASM.

In an intelligently written and enthusiastic article on electricity as a motive power, the *Sun* of this city, last Sunday, presented some figures and statements to show the wonderful growth of this industry in the past two or three years. The Aldermen of New York who have been opposing the adoption of electricity by the Fourth Avenue surface railway, will find it interesting reading provided they can read. In conclusion the *Sun's* report says:

But these are only detached and scattered illustrations to show the wonderful resources of the little giant that has sprung up within the last four years. Right here in New York, where men are not looking for novelties, and will only consent to accept novelties when they are presented with so much force that they are irresistible, the electric motor is becoming as common as household words.

The Aldermen have no security when they spring to the top of a ten-story building in an elevator that they have not one of these dangerous little motors that must be kept out of the street cars for public security right under their feet. They can hardly move along the street for two blocks without passing under wires loaded with anywhere from one to fifty horse-power for their destruction. The manager of one of the manufacturing motor companies in New York, probably as well informed as any one on what is going forward, places the number of electric motors in the city at 1,500, a remarkable total when we consider the length of time the motor has been in the field in a form that could make it commercially available.

The chief secret of the rapid advance of this new mechanical agent is found in the flexibility of its resources. Electricity is not the generator of power, but only the agency for its transmission and distribution, as it is an agent for the transmission of the human voice over the telephone wire. Through its resources power can be distributed to any point, and in quantities to suit the customer. Steam, water, air, caloric, or any known agency for generating power is either stationary or it demands stationary appliances; but electricity is its messenger boy, its Puck, who will consent to do its errands invisibly, and never ask a day off or the grant of liberty. Does a lady want an infinitesimal bit of electrical energy to relieve her boot on the treadle of her sewing machine? It can be delivered in her room through an iron box not much bigger than her reticule. Is the restaurant keeper plagued by an invasion of flies that expel all but the most hungry and least profitable customers? They can be gently wafted to the door by a multitude of revolving fans and conged out either into the bright sunlight or the refreshing shower. Everywhere, anywhere, without a particle of dust, offensive odor or disagreeable noise, the electric motor can be set to work, and while it will bring the substance of the thing wanted, it will leave behind everything that can give offence.

The electric motor has passed its experimental stages, and the day seems to be rapidly approaching when every house will find something for it to do in lifting burdens from floor to floor, and performing every possible labor that can be done by machinery. Manufacturers have not yet begun to construct motors ornamented with gold leaf, mother of pearl, and precious stones to rock cradles in the nurseries, but these requirements will come in time.

THE BELL TELEPHONE VS. THE CUSHMAN.

The electrical sensation at Chicago is the suit of the American Bell and Chicago Telephone Companies against the Cushman Telephone Company.

The statement is made by Cushman that he made the discovery in 1851, while he was engaged in constructing a railroad between Racine and Beloit. He says he concluded to put in a little spare time in making a lightning arrestor. He laid a telegraph wire, as he says, from one point on the railroad to another point a few hundred feet distant, and inclosed each end of the wire in a plain wooden box. One of the boxes was in the cellar of the telegraph station, according to Cushman's chronicle. While experimenting with the box in the cellar of the station, Cushman avers that he was somewhat astonished to hear emanating from the box certain sounds which closely resembled the peculiar piping of a bull-frog. Several other parties who heard it said it must be the work of the devil.

Cushman was not afraid. He defied the devil instead of deifying him, and shouted back, "Hello!" and was answered by a very distinct "Well." "Then," says Mr. Cushman, "I called out again, and said to Aaron Clark, 'Shall I bring down your dinner?' and the answer came back, 'Yes; is that you, Cushman?'"

He says that, in 1867, he travelled through Ohio and exhibited his invention, and before the commissioner who took testimony for the trial he produced twenty-one witnesses who swore to seeing the alleged invention in 1851 on the railroad track in Wisconsin, and in 1867 when exhibited in Ohio.

The Bell Company, to test the probability of the claims made by Cushman, constructed an apparatus precisely such as was described by the defendent, and claimed to have been used in 1851. No minute detail was omitted, and the apparatus was totally unable to reproduce the piping of bull-frogs. Even a sharp whistle blown in one box was inaudable in the other. The Bell folks claim that the Cushman invention was simply an acoustic telephone, and that it was valuless for want of principles and combinations discovered long since its claimed date of invention.

One of the funny things in the case was the way in which George S. Roberts, one of the Bell attorneys, referred to the testimony. He said, substantially:

"The Court is asked to believe that in 1867 and 1868, Cushman publicly exhibited the same electrical apparatus in Ohio and fully explained the method of its operation for the transmission of articulate speech, and that, nevertheless, this wonderful announcement that speech could be transmitted electrically, accompanied by explanations of how it was done and by the exhibition of apparatus for doing it, although repeated in several places, was not even mentioned by the local newspapers, which are commonly quite eager to publish novel items. The fact of the case is that nobody ever heard of Mr. Cushman's claim until after the patent was secured by Bell. Then Cushman used his alleged invention to secure a position with the Bell Company, which he held at $180 per month, for three years until 1885. Cushman is the sole witness who testifies to the circumstances of his discovery, and is not corroborated except in unimportant matters, and that by an eighty-seven-year-old brother and other witnesses who were called upon to remember things which are alleged to have happened thirty-five years ago. There was no cellar under the building where Cushman says he placed one box of his telephone in 1851, and there are other facts equally at variance with Cushman's claims."

The similarity of this testimony to some of that sworn to in the Drawbaugh case is quite marked.

The Bell Company also claims that the rights of Cushman, if he ever had any, lapsed long ago; so that if it can be made to appear that he never had any rights in the first place, and afterward lost them, the Cushman foundation is quite liable to be swept away, and the entire structure must fall.

The case has been on all the week and will probably reach a finality about Monday.

Several members of the club expect to visit Boston on the 21st, and help celebrate the first anniversary of the Electric Club of that city.

NOTE ON THE TESLA ALTERNATING CURRENT MOTOR.

BY DR. LOUIS DUNCAN, OF JOHNS HOPKINS UNIVERSITY.

Since writing my last note on this motor Mr. Tesla has read an interesting description of his system before the Institute of Electrical Engineers, and in his answer to the note referred to he has further described his motors. The study of both of these papers has increased my admiration for the simplicity and success of his system.

The motor discussed in my last note was of the synchronous type with two short-circuited coils at right angles to one another.* Further, Mr. Tesla in his paper before the Institute of Electrical Engineers states that "in a general distributing system of this kind the following plan should be adopted. * * * The motors operated from this generator should be of the synchronous type, but possessing sufficient rotary effort to insure starting." So I will reconsider the statements I made in the previous note with reference to this type and try to see if they should be modified. With respect to my views as to the theory of such a motor, they look at the phenomena from a different standpoint from that taken in Mr. Tesla's paper, and an unfortunate misprint ("It" for "I," the symbol used to represent current), greatly obscures the meaning. Apart from this, my conclusions were, that it was doubtful if such a motor would start under load—meaning to attain its proper number of revolutions—that if a load of great inertia be suddenly applied so that the motor is called on for more than its maximum load, it will stop or take up some slower speed; and finally, that the currents do not decrease in proportion to the load. Now, the first two questions can be settled so easily and simply by experiment that it is hardly worth while attempting to evolve reasons for believing one way or the other. The way I would look at it is this: The motor combines a synchronous and non-synchronous part; the former does little work until the motor reaches its normal speed; the latter does considerable work until the motor reaches a speed lower than the normal by an amount depending on the load. Now, how is the speed to jump from this lower value at which equilibrium is reached, to the normal value? It might do so in a number of cases where the inertia is great—in others I must confess to doubts. As to the second point my objection follows directly from what I have said above.

With respect to the consumption of current at small loads, I think that in any synchronous motor the effect of decreasing load is simply to decrease the difference between two quantities of work; one plus, the other minus, that the motor does. If this is the case the currents should not vary in proportion to the load, but should be greater in proportion with smaller loads.

With respect to the non-synchronous motors, however, I have very little but admiration to express. I cannot help thinking that they can be governed without resorting to synchronism, and in this case they will have advantages that will greatly aid in the advance of electric distribution.

Finally, I must confess to some disappointment that no data has been given as to the performance of Mr. Tesla's motors. One cannot, of course, expect from machines that are just emerging from an experimental state, the efficiency and output that they will finally attain, but a few curves of the currents in the magnets and armature coils under different conditions would tell us more of the possibilities and directions of improvement than could any amount of discussion.

In the meantime I would congratulate Mr. Tesla on the discovery and application of a novel means of obtaining continuous rotation from alternating currents, and I shall watch the further development of his system with interest.

*See description in ELECTRICAL REVIEW of May 26.

Prof. Anthony will have something to say about "overhead wires" at the club meeting on 28th inst.

OUR CHICAGO LETTER.

(Special Correspondence.)

Just at this time in Chicago when the new system of switchboard is being introduced, and the operators are doing their best to unlearn what they knew, and get the hang of the new system, the general public is quite willing to put up with a good deal of annoyance, in the hope of a better condition of affairs in the near future. But foreign circumstances sometimes has the good nature of humanity, and kick over what otherwise would be all amiability and good manners. There is always a time in every newspaper man's life when, short of copy, with a dearth of items, a howling devil prodding him, and a lot of dry exchanges thrice culled to cut from, he feels that even a row with his dear wife would make an acceptable chunk of padding. An evening paper here, the other day, was thus caught with the meat barrel empty, and the shortcomings of the telephone company were nuts to crack, so the reporter wrote by the yard till the space was full. The closing paragraph is refreshing:

"Under the present order of things the man who would use a Chicago telephone is compelled to wait until the clouds roll by, the cows come home, and sundry other similar important events occur before he can secure the desired connection. And when finally the boon of a short interview with the person at the other end of the line seems to be within his grasp he is suddenly 'cut off,' and his voice is lost in the hum and buzz of the central office. He is once more left high and dry and flounders about as helpless as a fish on terra firma. The chances are that if he finally receives the connection, it is only at a heavy loss of time and a complete loss of patience. This is not an exaggerated picture of the situation; its fidelity cannot fail of recognition with those who know anything of the facts. As things now stand, that man is a marvel who can use the Chicago telephone without having his temper ruffled, box-plaited, flounced, scalloped, and otherwise decorated with annoying frills and furbelows. The service must be improved, and that speedily."

There is trouble also in Missouri. The St. Louis Telephone Company has notified its subscribers that no renewals will be taken, at any price, while the $50 per annum ordinance remains. Manager Durant says one fine is all he cares to pay, and as fast as the present leases expire he will remove the instruments. The Mayor has consulted with legal authority and says as soon as he learns officially that the company refuses to perform its duty as a common carrier, he will order the poles and wires removed from the streets. He says the company may go out of business, but cannot maintain its useless poles and wires. St. Louis had about 2,200 telephones before the rumpus. The trouble has been precipitated by the expiration of about twenty-five contracts held by the city, and the removal of that number of "hello" machines in the last few days.

In the recent case of the Brush *vs* the Fort Wayne Jenney Company, Judge Gresham delivered the following opinion and the case was dismissed for want of equity:

"1. The invention is shown in the patents, 212,183 and 219,208, but in 212,183 the examiner held that Brush's claims were too broad. The decisson was acquiesced in, and the invention which was there described, claimed, and rejected is now claimed in the patent sued on. The rejected invention was dedicated to the public by acquiescence in the ruling of the examiner, and cannot be claimed in a subsequent patent against others who meantime entered the field and used the rejected invention.

"2. The patent in suit is limited to solonoids and cares mechanically opposed, and it does not include the common or electro-magnet, and thus construed the patent sued on is not infringed by the defendants."

There are cases now pending against the Indianapolis Jenney Company by the Fort Wayne Company, claiming infringement on the ground that the Indianapolis company is using the Fort Wayne construction of the general principle which is covered by them in a patent in 1882. The winners in the above suit say they will now push the cases against the Indianapolis company.

F. E. Degenhardt, Manager of the Western Department of the Standard Underground Cable Co., of Pittsburgh, has just closed a three years' engagement with his employers. Fred. got no vacation, however, for arrangement was duplicated, and he will remain with the company another three years. It is well thus. The company would search long and far before substituting an agent who could profitably and acceptably fill that gentleman's shoes hereabouts.

The Fort Worth and Denver Telegraph Company went over to the Western Union on the 2d instant. The name of the line tells its extent. The funeral was strictly private, and there were no flowers.

W. E. Sharps, of the Edgerton Motor Company, Philadelphia, has been a constant visitor at the Club for the past week.

George F. Porter, of the Faraday Carbon Company, has also met the boys at the Club, repeatedly, of late.

Capt. Willard Candee, of Okonite fame, was also a visitor. Candee received quite a shock before he had been in town long enough to set down his grip sack or eat a bite. It wasn't a serious affair, but was as sudden as electrical shocks usually are. Porter was responsible.

R. T. McDonald flew through the city like a blue streak as usual, on Friday. Some of his friends saw him twice, during his stay. Once at lunch, McD. is a busy man.

Chicago, June 11th, 1888. C. C. H.

OUR BOSTON LETTER.

(Special Correspondence.)

The United States War Department has invited the graduates in electrical engineering at the Massachusetts Institute of Technology to take a course of study upon the application of electricity to naval warfare at the torpedo station, Newport, R. I.

The Eco Magnetic Watch and Clock Company, of this city, has received an order to put up one of their magnetic clocks in the Treasury Department at Washington.

The Thomson Welding Company is furnishing Messrs. Wallace & Son, copper wire manufacturers at Ansonia, Conn., with a complete electric welding plant.

The same company has also shipped the apparatus for the construction of a welding plant at the works of the Bridgeport Brass Company of Connecticut.

The Boston Electric Club held the last of its series of pleasant Wednesday evening "talks" on May 30th, the subject presented being "Some of the Practical Applications of Electric Welding," by Mr. O. K. Stuart. The speaker exhibited many samples showing the adaptability of electric welding to the various mechanic arts.

The Boston *Herald* for June 1st contains a very interesting and well written article upon electric street railways, which speaks very favorably of the economy of this method of transportation as compared with either the horse or cable systems.

The question of underground conduits was recently taken up by the Massachusetts legislature, and a bill was introduced giving power to the mayor and aldermen of any city or the selectmen of any town to compel all electrical wires to be laid underground if, in their opinion, it is deemed best. This bill was passed on May 25th by the House of Representatives. In the Senate it was read twice, but was refused a third reading. On Wednesday, June 6th, an order was passed in the Boston Board of Aldermen directing the Superintendent of Streets to issue a permit to the conduit company to begin operations. An order was also passed that no more permits for this purpose should be issued without the approval of the Board of Aldermen. Henry E. Cobb, R. M. Pulsifer and others being the conduit company, have accepted the franchise and locations and have filed the necessary bond of $200,000. Interesting developments may be looked for.

On Saturday morning, June 2d, at about 12.40 o'clock, the Edison Electric Light station on Head Place, in this city, was burned out. The fire, it is thought, started in the equalizer boxes on the second floor, and spread rapidly, completely destroying every one of the fourteen 500-light dynamos, with which the station was equipped.

The boiler room, which was separated by fire-proof walls, was not reached by the flames, so the boilers and engines were not injured. The loss to the company has been settled by the underwriters for $33,500. The buildings in the neighborhood were damaged to the extent of about $8,000. The Boston Fire Department deserves great credit for its skill and energy displayed, the fire being entirely extinguished within one hour after the alarm was rung. The ceilings are now being torn down and the debris cleared away. The station will be rebuilt with fire proof walls and concrete floors throughout, and no wood will be used in construction except where it is absolutely necessary. Within twenty hours after the fire, the station was again running, with seven Edison dynamos obtained from different places in the city, and supplying all its subscribers with light and power.

L. A. F.

Boston, June 9.

OUR PHILADELPHIA LETTER.

(Special Correspondence.)

There seems to be a decided tendency on the part of the citizens of Philadelphia, to organize themselves into local mutual electric lighting companies; this is due undoubtedly to the feeling that the Electric Trust of the city is a monopoly with the sole object of obtaining the largest possible price for the lights, without regard to their excellence or the cost of production. This is, I think, a mistaken idea of the situation, and I do not believe that the Trust is fattening on the blood of the people, as so many of the salesmen of electric apparatus would have us believe.

It is quite easy to persuade a store-keeper that the charge of fifty cents a night for his arc lamp is excessive, and that if a number of his neighbors would join him in organizing a mutual company, that this expense could be reduced over fifty per cent., and to prove it, figures are given reciting the cost of an engineer, coal and carbons, as though these were all the factors of expense with which an electric light company had to do. Omission is purposely made of the very important one, known to all properly conducted corporations, as the "cost of deterioration," or if this is allu ed to, it is blown aside by the statement that the annual expenditure of a few dollars will keep the plant just as good at the end of twenty years as it was on the day it was started.

Old timers in the business know this is not true, and that a considerable proportion of each year's earnings ought to be set aside to meet the wear and tear of machinery and pole-lines; it would be well, therefore, if those contemplating the organization of these co-operative companies, would consult competent authorities on the subject, before entering upon an enterprise of which they have, at best, a very limited knowledge. Otherwise we may look for great disappointment on the part of the projectors of these enterprises, and the real merits of electric lighting will suffer in consequence.

The Thomson-Houston Company have, through the agency of that prince of good fellows, Cooper Cloud, effected the sale of an arc plant to light the extensive stores of the Messrs. Shonneman Bros., on North Eighth street, and thus added another to their long list of isolated plants in this city.

The Enterprise Electric Company, 55 South Third street, have about completed the installation of a 250 light plant of the Mather system in the Continental Hotel at Sea Isle City, N. J., which will be, when finished, one of the largest and finests hotels on the coast.

The Edison Illuminating Company, of the same town, have just given out their contracts for the erection of a central station plant, and the work will be rushed to a conclusion; they promised to have the lights on the town by July 4th, but, of course, that is an impossibility in the limited time now left them; but that they will get there during the summer, there is no shadow of doubt. Of course, as the name implies, the Edison system will be used, and the credit of securing the sale in spite of extensive competition is due to our genial friend Silsby, of the Edison United Manufacturing Company, 65 Fifth avenue, New York. He has also taken the contract for supplying the Gloucester ferry boats with lights of the same system.

On the other hand, the Westinghouse people are putting their lights on the remaining boats of the Camden Ferry Company, after a trial of the system for the last six months on two of them.

Bragg, of the United States Company, says he has just sold two incandescent plants, but as he won't say where they are on account of his native modesty, I am inclined to think he calls hopes realities.

The Germantown Electric Light Company, T-H. system, are contemplating an increase of their plant.

The subject of the electric light plant for our new City Hall has become interesting this week, on account of the remarks of Chief Commissioner Perkins at the meeting of the Board, on Thursday, to the effect that some definite action must be at once taken, and the wiring done before proceeding farther with the work of completing the interiors of the various offices now needed and called for by the different city departments. The Board of Commissioners have the right to compel the City Councils to appropriate annually such sums as may be needed to prosecute the work in hand; this year more than $1,200,000 was asked for but the councils only appropriated $500,000, and the Board are now seriously contemplating the question of mandamussing Councils to appropriate the additional $700,000, even if a special tax has to be levied for this object. Of course the electric plant only requires a small portion of the sum, but as it will consist of at least 15,000 lights and its accompanying steam plant, it will be readily seen, that this is the electrical plum, not only of the season, but of the century. No doubt the competition to secure the job, will be intense, but it is safe to say that no favoritism in the award will be shown, and the case decided strictly on its merits. The matter is now in the hands of a committee composed of Samuel C. Perkins, chief of the Building Commission; John McArthur, Jr., its architect; and David R. Walker, chief of the Electrical Department; the high character of the committee is a sufficient guaranty that the award will be made for merit and not for fear or favor.

Philadelphia, June 11, 1888. S. H.

ELECTRICITY TO LIGHT GEDNEY'S CHANNEL.

The Mackenzie-Melins system of lighting buoys by electricity has been thoroughly tested during the past winter and spring, and has proved so satisfactory, that the Light House Commissioners have determined to light Gedney's Channel in the same manner as the Robbins' Reef buoy has been lighted since January last, and have obtained an appropriation of about $20,000 for the purpose.

The plant for generating the current will be located on Sandy Hook; the electrical portion costing $1,125 will be furnished by the Edison Company; the steam plant furnished by E. P. Hampson & Co. will cost $2,100. To connect the plant with the six buoys will require over 100,000 feet of conductors, which will be put up in two three-conductor cables each about three miles long, and about 30,000 feet single-conductor.

The three-conductor cables will be run from the Sandy Hook station to the westerly buoys on either side of the channel, and terminate in junction boxes, from which the conductors will issue as three separate single-conductor cables, each of which will be connected with a separate buoy. Each lamp will be lighted by a single conductor, the return being connected with the armor of the cable-ground, returns having been shown by experiments on Robbins' Reef cable to be entirely satisfactory. The Robbins' Reef cable was furnished by the Bishop Gutta Percha Co., and as it has stood the various tests well, gutta percha was decided to be the insulator acceptable for the new cables, and the contract for furnishing and laying has been awarded to the Bishop Gutta Percha Co., the price being $10,720.

The contracts are to be completed in 60 days and we may expect to have the buoys sparkling by the 1st of August.

Personal.

Mr. A. Van Winkle has returned from a pleasant European trip.

Mr. Schuyler S. Wheeler is the author of an interesting illustrated description of the Edison phonograph in *Harper's Weekly*, June 9th.

Mr. Henry C. Davis, president of the Sawyer-Man Electric Company, sailed for Europe on Saturday's steamer, to be absent about six weeks.

W. Stanley, Jr., one of the several bright electrical men that the Westinghouse Electric Company has secured on its staff, was a New York visitor last week.

A. Ward Charles Dutton has been a New York deserter the past week, enjoying the quiet and calm so agreeable to him, which is found only in Philadelphia.

Mr. Jonas Venström, an electrical engineer of Orebro, Sweden, is visiting New York and was a visitor at the REVIEW office. Mr. Venström will spend some time in this country investigating electrical matters.

Mr. T. W. Sprague, our Boston representative, is enjoying a vacation visiting St. Paul and other western cities. During his absence, Mr. Louis A. Ferguson will keep the REVIEW readers posted on electrical happenings at the Hub.

Mr. E. T. Gilliland has recovered from a severe sickness that confined him to his home for ten days past. His steam yacht "Edith," which was built for Dr. J. G. Holland by Herreschoff, of Bristol, Conn., has arrived here from Florida, and Mr. Gilliland at once realized that it wouldn't pay to be sick with a steam yacht waiting to be used, and forthwith recovered, and will soon be shooting around New York on the bounding billows.

TELEGRAPHIC

.... The Western Union Telegraph Company has bought the plant of the Poughkeepsie District Telegraph Company.

.... The Western Union Telegraph Company has sold the building at 70–76 Church street, occupied by the Western Electric Company. The latter company will be in its new building on Thames street next May.

.... The sale of the Fort Worth and Denver Telegraph Company to the Western Union is announced. The line extends from Fort Worth to Denver, and is the only telegraph line running northwest from the Pan Handle. The terms were not made known.

Meeting of Railway Telegraphers.

The seventh annual meeting of the Association of Railway Telegraph Superintendents will be held at the Murray Hill Hotel, New York, July 11th. Mr. Charles Selden, of Baltimore, is chairman of the committee on electrical devices, and W. J. Holmes, S. S. Bogart, and C. E. Topping, of New York, compose the committee on space.

The meeting promises to be an interesting and edifying one, and will be largely attended by the able and energetic men who comprise the staff of this very important branch of railroad work

Telephone Facilities in New York.

Our telephonic aids are not much to boast of, but we have hopes, as preparations for the reorganization and concentration of the Metropolitan Telephone and Telegraph Company's system have been quietly going on for some time. Probably within a year most of the various exchanges or "central offices" will have been merged into two monster stations. A gigantic switchboard in the company's new building in Cortlandt street is going to accomplish all this.

Around three sides of the operating-room on the top floor of the building is this switchboard, which might roughly be described as a sort of continuous desk, about six feet high, with the projecting ledge not more than two feet above the floor. A light framework rises about two feet or so above the back of this desk, from which the insulated cords employed in making the connections depend. The upright back of the board is pierced with thousands of brass-lined holes, technically known as "spring jacks," and above each hole a number is stamped. Each subscriber whose wire runs to the switchboard, has as many of these holes as there are sections in the board. And it is by connecting one of the holes bearing his number with a hole belonging to the number called for that the operator gives him the desired connection. The approximate length of the switchboard—which is undoubtedly the largest in the world—is about 300 feet. So expensive are the polished hard woods and electric appliances employed in its construction, that the total cost will be about $350,000. It is expected that about September 1st it will be in readiness to receive the wires. As soon as it is completed, all the telephone exchanges south of the "Spring" exchange will be discontinued, and their subscribers connected with this central switchboard. The board is designed to accommodate upward of 10,000 subscribers, and when completed and in active operation under the deft fingers of 100 or more pretty girls, will be one of the sights of the metropolis.

The Metropolitan Company has purchased several lots uptown, and intends to there erect a building which will almost duplicate the downtown building, big switchboard and all. The site is on the south side of West Thirty-eighth street, between Broadway and Seventh avenue. The twenty-first street and Thirty-ninth street exchanges will be consolidated in the new building, which alone will cost about $250,000.—*Jos. Howard, in Boston Globe.*

The Perfected Phonograph.

BY THOMAS A. EDISON, IN THE "NORTH AMERICAN REVIEW" FOR JUNE.

Ten years ago I contributed to the *North American Review* (May-June, 1878), a paper on the "Phonograph and its Future," in which I sketched the solution of certain problems accomplished by my invention, and predicted some of the uses to which it would be put. Other weighty matters engaged much of my time and attention after that article was published, but the future of which I then spoke has now arrived, and the predictions which I made at that time are now verified. For, when these words appear in print, the demonstration of the phonograph's practical adaptability to the purposes mentioned by me will have been completed, and the perfected instrument itself will be in the hands of the public, to be tested and employed by them at will. Rumors, I understand, have been circulated to the effect that, subsequently to my announcements made ten years ago, I allowed the phonograph to go adrift, leaving its further development to chance and to the tender mercies of such disinterested persons, not connected with me, as might conceive that they were doing me a favor by claiming to have developed my idea. Those who may have been taken in by these rumors would do well to inform themselves concerning the prolonged labor involved in carrying out important inventions. They are also referred to my former statements in this *Review*, as proof that the signer of those statements at least knew clearly what he was talking about and predicted only that which he has now fulfilled.

Since the time of Lucretius, the movements of atoms have been invested with an intense interest for philosophers and scientific students, and the wave-motions of light, heat and sound have engaged, with a constantly increasing degree of importance, the attention of modern investigators. When we consider the relation of these motions to mathematics and to music, the conception of Pythagoras that number and harmony constituted the principle of the Universe does not seem to be very far out of the way. In the phonograph we find an illustration of the truth that human speech is governed by the laws of number, harmony and rhythm. And by means of these laws, we are now able to register all sorts of sound and all articulate utterance—even to the slightest shades and variations of the voice—in lines or dots which are an absolute equivalent for the emission of sound by the lips; so that, through this contrivance, we can cause these lines and dots to give forth again the sound of the voice, of music, and all other sounds recorded by them, whether audible or *inaudible*. For it is a very extraordinary fact that, while the deepest tone that our ears are capable of recognizing is one containing 16 vibrations a second, the phonograph will record 10 vibrations or less, and can then raise the pitch until we hear a reproduction from them. Similarly, vibrations above the highest rate audible to the ear can be recorded on the phonograph and then reproduced by lowering the pitch, until we actually hear the record of those inaudable pulsations.

To make the general idea of the recording of sound more clear, let me remark one or two points. We have all been struck by the precision with which even the faintest sea-waves impress upon the surface of a beach the fine, sinuous line which is formed by the rippling edge of their advance. Almost as familiar is the fact that grains of sand sprinkled on a smooth surface of glass or wood, on or near a piano, sift themselves into various lines and curves according to the vibrations of the melody played on the piano-keys. These things indicate how easily the particles of solid matter may receive an imparted motion, or take an impression, from delicate liquid waves, air waves, or waves of sound. Yet, well known though these phenomena are, they apparently never suggested until within a few years that the sound-waves set going by a human voice might be so directed as to trace an impression upon some solid substance, with a nicety equal to that of the tide in recording its flow upon a sand beach.

My own discovery that this could be done came to me almost accidentally while I was busy with experiments having a different object in view. I was engaged upon a machine intended to repeat Morse characters, which were recorded on paper by indentations that transferred their message to another circuit automatically, when passed under a tracing-point connected with a circuit-closing apparatus. In manipulating this machine I found that when the cylinder carrying the indented paper was turned with great swiftness, it gave off a humming noise from the indentations—a musical, rythmic sound resembling that of human talk heard indistinctly. This led me to try fitting a diaphragm to the machine, which would receive the vibrations or sound-waves made by my voice when I talked to it, and register these vibrations upon an impressible material placed on the cylinder. The material selected for immediate use was paraffined paper, and the results obtained were excellent. The indentations on the cylinder, when rapidly revolved, caused a repetition of the original vibrations to reach the ear through a recorder, just as if the machine itself were speaking. I saw at once that the problem of registering human speech, so that it could be repeated by mechanical means as often as might be desired, was solved.

The history of the phonograph as it was then devised and manufactured in small quantity, merely for purposes of public exhibition and explanation, need not be repeated here. The idea occurred to me in the spring of 1877, and, according as I could get leisure, I gave my attention to preparing the few exhibition machines which were placed before the public in 1878, and then universally recognized by scientific men and every one else as an absolute novelty. These machines, of course, exemplified only a small part of the capacity of the phonograph. I was hard at work describing and noting down the various parts of the machine as it would appear when perfected, and making drawings of them in various forms.

As it was impossible to drop my work and sit down to tell the public what I was doing every day, I noted briefly in my *North American Review* article of May-June, 1878, some of the things which I proposed to accomplish. The details of the electric light and other inventions afterward absorbed much of my time and attention. My laboratory was converted into a factory in order to supply the demand for the electric light, and my progress in carrying out my ideas about the phonograph, though continuous, was necessarily retarded. For months past, however, I have had a special factory in operation, producing the component parts of the perfected phonograph, so as to bring the machine within the reach of the public in the form which I originally designed it to take.

It may be of interest, here, to contrast briefly the perfected phonograph with the mere exhibition models shown, all over the world, in 1878. Those models were large, heavy machines which purposely sacrificed distinctness of articulation, in order to secure a loud tone which could be heard in a large room when emitted through a funnel-shaped transmitter. Tin-foil was used as the material on which the indentations were to be made. The cylinders were revolved by hand, or by clock-work; and there were numerous other details of construction which differed from those of the instrument as now completed. At that time I had made various designs for a special kind of electric motor, differing from all others, to run the machine, in place of clock-work; and the phonograph as we now manufacture it is provided with such a motor, which turns the cylinder noiselessly, uniformly and easily. Instead of tin-foil, I now use a cylinder of wax for receiving the record of sound-pulsations, as in the original experiment. One diaphragm (the "recorder") receives these pulsations, which are incised on the wax, in exceedingly fine lines, hardly visible to the naked eye, by means of a small point pressing against the wax. A turning tool attachment, near this recording diaphragm, pares off the surface of the wax, removing any record which may previously have been left there, and smoothing the way for whatever you wish to speak into the "recorder." When you have finished speaking, two simple motions bring the reproducing diaphragm into place directly over the wax; and this diaphragm, provided with a very delicate but durable needle, takes up and reproduces the vibrations registered in the fine lines of indentation, bringing them to the ear by means of a tube. Sometimes, indeed, one can hear the recorded words as they are thrown off by the needle from the revolving cylinder, without using a tube at all, and simply by putting the ear close to the wax. The adjustments of these receiving and transmitting diaphragms, known as the "recorder" and the "reproducer," are very exact, but very easily arranged. And a machine, once adjusted after being set up, will run well with very little attention or readjustment, for a long period of time. The battery, also, conveniently placed in a box under the desk which holds the instrument, will last for six weeks or more, according to use, without renewal. A scale and indicator running the whole length of the cylinder, in front, enable you to observe at what point you began talking, so that the reproducer may be set at that point on the wax as soon as you wish to take off the record. Another very handy attachment supplies a key for suspending the reproduction of sounds when it is going on too rapidly for the copyist who is writing it out. A second key, when pressed down, will run the reproducer back so as to repeat anything which has not been clearly understood, and this may be done any desired number of times,

A single wax cylinder, or blank, may be used for fifteen or twenty successive records before it is worn out. But if the record is to be kept, the wax blank must not be talked upon again, and is simply slipped off from the metal cylinder and filed away for future reference. It may be fitted on to the cylinder again at any time, and will at once utter whatever has been registered on it. One of these wax blanks will repeat its contents thousands of times with undiminished clearness. Further, we are able to multiply to any extent, at slight cost, phonographic copies of the blank, after the talking, or music, or other sounds, have been put upon it once.

It is curious to reflect that the Assyrians and Babylonians, 2,500 years ago, chose baked clay cylinders inscribed with cuneiform characters, as their medium for perpetuating records; while this recent result of modern science, the phonograph, uses cylinders of wax for a similar purpose, but with the great and progressive difference that our wax cylinders speak for themselves, and will not have to wait dumbly for centuries to be deciphered, like the famous Kileh-Shergat cylinder, by a Rawlinson or a Layard. With our facilities, a sovereign, a statesman, or a historian, can inscribe his words on a phonograph blank, which will then be multiplied a thousand-fold; each multiple copy will repeat the sounds of his voice thousands of times; and so, by reserving the copies and using them in relays, his utterance can be transmitted to posterity, centuries afterwards, as freshly and forcibly as if those later generations heard his living accents. Instrumental and vocal music—solos, duets, quartets, quintets, etc.—can be recorded on the perfected phonograph with startling completeness and precision. How interesting it will be to future generations to learn from the phonograph exactly how Rubinstein played a composition on the piano; and what a priceless possession it would have been to us, could we have Gen. Grant's memorable words, "Let us have peace," inscribed on the phonograph for perpetual reproduction in his own intonations! We are in a position to obtain results of this sort, by the present phonograph, from the wave-motions of sound; so that it seems to me we realize here the "poetry of motion" in a new sense, combined with the *science* of motion.

In my article ten years ago, I enumerated among the uses to which the phonograph would be applied: 1. Letter writing and all kinds of dictation without the aid of a stenographer. 2. Phonographic books, which would speak to blind people without effort on their part. 3. The teaching of elocution. 4. Reproduction of music. 5. The "Family Record"—a registry of sayings, reminiscences, etc., by members of a family, in their own voices, and of the last words of dying persons. 6. Music boxes and toys. 7. Clocks that should announce in articulate speech the time for going home, going to meals, etc. 8. The preservation of languages, by exact reproduction of the manner of pronouncing. 9. Educational purposes; such as preserving the explanations made by a teacher, so that the pupil can refer to them at any moment, and spelling or other lessons placed upon the phonograph for convenience in committing to memory. 10. Connection with the telephone, so as to make that invention an auxiliary in the transmission of permanent and invaluable records, instead of being the recipient of momentary and fleeting communications.

Every one of these uses the perfected phonograph is now ready to carry out. I may add that, through the facility with which it stores up and reproduces music of all sorts, or whistling and recitations, it can be employed to furnish constant amusement to invalids, or to social assemblies, at receptions, dinners, etc. Any one sitting in his room alone may order an assorted supply of wax cylinders inscribed with songs, poems, piano or violin music, short stories, anecdotes or dialect pieces, and, by putting them on his phonograph, he can listen to them as originally sung or recited by authors, vocalists and actors, or elocutionists. The variety of entertainment he thus commands, at trifling expense and without moving from his chair, is practically unlimited. Music by a band, in fact whole operas, can be stored up on the cylinders, and the voice of Patti singing in England can thus be heard again on this side the ocean, or preserved for future generations. On four cylinders eight inches long, with a diameter of five, I can put the whole of "Nicholas Nickleby" in phonogram form. In teaching the correct pronunciation of English, and especially of foreign languages, the phonograph as it stands seems to be beyond comparison, for no system of phonetic spelling can convey to the pupil the pronunciation of a good English, French, German or Spanish speaker so well as a machine that reproduces his utterances even more exactly than a human imitator could.

The speeches of orators, the discources of clergymen, can be had "on tap" in every house that owns a phonograph. It would not be very surprising if, a few years hence, phonographic newspaper bulletins should be issued on wax cylinders. Even now, so soon as the phonograph comes into general use, newspaper reporters and correspondents can talk their matter into the phonograph, either in the editorial office or at some distant point, by a telephone wire connected with a phonograph in the composing-room, so that the communication may be set up in type without any preliminary of writing it out in long hand.

The wax cylinders can be sent through the mails in little boxes which I have had prepared for that purpose, and then put upon another phonograph at a distant point, to be listened to by a friend or business correspondent. To obviate the difficulty caused by the friend's not having a phonograph of his own, pay stations will be established, to which any one may take the phonogram that he has received, have it placed on the instrument, and the contents recited to him from the machine, as well as copied out at the same moment by a type-writer. Thus the phonograph will be at the service of every one who can command a few cents for the fee. And which of us would not rather pay something extra in order to hear a dear friend's or relative's voice speaking to us from the other side of the earth?

Authors can register their fleeting ideas and brief notes on the phonograph at any hour of day or night, without waiting to find pen, ink or paper, and in much less time than it would take to write out even the shortest memoranda. They can also publish their novels or essays exclusively in phonogram form, so as to talk to their readers personally; and in this way they can protect their works from being stolen by means of defective copyright laws. Musical composers, in improvising compositions, will be able to have them recorded instantaneously on the phonograph.

For the present it has been decided to make all the phonographs of uniform size; so that a record put upon the machine in New York may be placed on another machine of the same pattern in China, and speak exactly as it was spoken to on this continent. Each wax blank will receive from 800 to 1,000 words; and, of course, several blanks may be used for one document, if needed. This uniform size and pattern make the thing perfectly practicable in offices which have business connections all over the globe. My private secretary to-day speaks all letters into a phonograph, from which they are taken off by a type-writer or ordinary long-hand writer, with an immense saving of time and trouble. Persons having a large correspondence can talk all their letters into the phonograph in a very short time, and leave them to be listened to and copied by an assistant, without the delay involved in stenography or the trouble of going over and correcting the copyist's work, which is almost inevitable under the conditions of dictation now prevailing.

Furthermore, two business men, conferring together, can talk into the recorder by means of a double transmitting tube, with perfect privacy, and yet obtain upon the cylinder an unimpeachable transcript of their conversation in their own voices, with every break and pause, every hesitation or confident affirmation, every partial suggestion or particular explanation, infallibly set down in the wax.

They can then have this conversation written out or typed by a secretary, for future reference; or can, if they prefer, have it multiple-copied by our mechanical process. In this way, many misunderstandings may be avoided. Interesting philosophic or literary discussions and dialogues may be recorded in the same way. In fact, the phonograph will do, and does at this moment accomplish, the same thing in respect of conversation which instantaneous photography does for moving objects; that is, it will present whatever it records with a minute accuracy unattained by any other means.

The most skillful observers, listeners and realistic novelists, or even stenographers, cannot reproduce a conversation exactly as it occurred. The account they give is more or less generalized. But the phonograph receives, and then transmits to our ears again, every least thing that was said—exactly *as* it was said—with the faultless fidelity of an instantaneous photograph. We shall now for the first time know what conversation really is; just as we have learned, only within a few years, through the instantaneous photograph, what attitudes are taken by the horse in motion.

Letters of introduction may be spoken on to a phonograph blank, without any of the formality of address and phraseology now customary, or the trouble of folding, enveloping and addressing a written communication. In fact all correspondence will be greatly simplified and wisely abbreviated by the use of phonograms. A telephone subscriber can place at his telephone a phonogram which will announce to the exchange, whenever he is called up, that he has left the office and will return at a certain time. Similarly, one man calling at the office of another and not finding him, will talk into the phonograph anything he wishes to say. This saves the trouble of writing a note, and obviates the uncertainty of giving to clerk, office boy or servant, an oral message that may be forgotten or incorrectly delivered. Hotels and clubs will, naturally, find this function of the phonograph extremely serviceable; and their guests, or patrons, will avail themselves of phonograms constantly. The accuracy of interviews with newspaper reporters will also be determined, no doubt, by phonographic record. And travelers in vestibule trains will be glad to use phonograph blanks in place of letter paper and telegraph blanks, owing to the difficulty of writing while on a rapidly moving train.

It must be borne in mind that I am not talking now of things which may be made possible in the future. I did my predicting ten years ago; and the functions above mentioned are those which the present perfected phonograph is able to fulfill at this moment. To use the phonograph, a little instruction and practice are needed, but much less than the type-writer requires and hardly more than the training needed for the operation of a sewing-machine.

Various other uses for which the phonograph is now fully ripe might be mentioned; but I do not want to give to these memoranda the character of a catalogue. Enough has been said, I think, to indicate that the phonograph, unlike children, should be "seen" *and* "heard." It is no longer in a state of infancy. It may be still in its childhood; but it is destined to a vigorous maturity. The phonograph, in one sense, knows more than we do ourselves. For it will retain a perfect mechanical memory of many things which we may forget, even though we have said them. It will become an important factor in education; and it will teach us to be careful what we say—for it imparts to us the gift of hearing ourselves as others hear us—exerting thus a decidedly moral influence by making men brief, businesslike and straightforward, cultivating improved manners, and uniting distant friends and associates by direct vocal communication.

The Baby and the Phonograph.

According to the New York *Herald*, Thomas A. Edison, the inventor, has been interesting himself with his new baby and a phonograph at his home. When the baby crowed with glee, the crow was registered on the phonograph; when it got mad and yelled, its piercing screams were irrevocably recorded on the same machine. That phonograph is now a receptacle of every known noise peculiar to babyhood. It is Mr. Edison's intention to take a record of the strength of the baby's lungs every three months. "I will preserve the record," said he, "until the child becomes a young lady. Then the phonograph can be operated for her benefit, and she can see for herself just what kind of a baby she was, and won't have to take her mother's and the nurse's words for it."

*** Stockholm is one of the best telephone cities in Europe. There are over 4,000 subscribers, and facilities are ready for 7,000, and the exchange is rapidly growing.

*** Telephone facilities have been extended from Spencer, Wis., to Colby, giving the latter place a connection with Unity, Spencer, Loyal, Neillsville, La Crosse and other points.

*** The energetic and intelligent work of Electrician Seeley at the 39th street exchange of the Metropolitan Telephone Company (recently burned out), has made the exchange as good as before, in a remarkable short time. The patrons of that exchange, if they realize at all the intricate and difficult work demanded, should feel deeply gratified over the prompt way in which the trouble was remedied. The exchange wires are all working satisfactorily now.

*** The fight is on in Chicago between American Bell Telephone Company and the Cushman Telephone Company. The defense in the case of Cushman and the Cushman Company, is that Cushman invented the appliances alleged to be infringed in 1851. But while Cushman claims the priority of invention, he does not contend that he prosecuted his telephone discovery to a patent. He was made acquainted with the ability of electricity as a medium for conveying sound, in Racine in 1851, and he put it in execution in a crude way. He claims that he perfected the idea in 1867. The instrument at issue in the present suit is the receiver. The apparatus through which the talking is done is the Blake transmitter, and is not involved in the suit now being tried.

At the Telephone.

Mrs. Wary (at the telephone)—"Hello, hello, Exchange."

After waiting some time without a reply, Mrs. Wary, in more vigorous tones, pipes out "hello."

Still no reply, whereupon Mrs. Wary softly murmurs so that the telephone will not hear her, "Well, I declare, if I don't believe I forgot to ring. How stupid." Which was a fact. Mrs. Wary then rings with a vigor and persistence without doubt intended to make up for her previous omissions, and is answered by the exchange.

"Connect me with number—number" (in an aside) "bless me but I've forgotten the number," (she so informs the exchange, but is finally put in communication with her friend, Mrs. Prim, when the following conversation ensues):

Mrs. Prim—"Is that you, Mrs. Wary?"

Mrs. Wary—"Why, of course, it is. How did you happen to call me up, I was just going to call you up. Isn't it nice."

Mrs. Prim—"Why so it is, and so funny. I wanted to speak to you in church last Sunday, but I didn't get a chance. Why, I didn't know that you ever went to Trinity."

Mrs. Wary—"Why, of course, I do. I think Mr. Lobdell is just lovely, but I go up to Ascension church now and then, I like Mr. Hitchcock real well, too."

Mrs. Prim—"Oh, I don't like him at all. I'll tell you who I think is nice, Dr. Fuller of St. Johns; why, I met him the other day just before he went away, on Delaware avenue, and we stood and chatted almost ten minutes, and he stood with his hat off all the time."

Mrs. Wary—"Yes, he always does that, I like him ever so much, but one can hardly ever get a chance to speak to him, those ridiculous Stevens girls are everlastingly hanging around him. Did you see them last Sunday? they were up at Trinity."

Mrs. Prim—"No, I didn't see them, how did they look?"

Mrs. Wary—"Perfectly frightful. They were dressed just alike in suits they had made in New York. I didn't think they had any style to them at all. They don't begin to have the style that Mrs. Lee's dresses have."

Mrs. Prim—"Do you go to Mrs. Lee?"

Mrs. Wary—"Why, yes, most of the time. I like Miss Ross pretty well, but I think I'll take my next dress to Mrs. Constantine. Did you see the dresses she made for Miss Marbourg?"

Mrs. Prim—"No, I didn't go to the Academy this week, but I heard they were very swell, but do you know I am having all my work done at the man dressmaker's on Chippewa street. His charges are simply fearful and George grumbles when he sees the bills, but he certainly does beautiful work."

Mrs. Wary—"But how could you ever bring yourself to let him cut and fit your dresses?"

Mrs. Prim—"Well, it did seem funny at first, and I suppose I looked just like a fool, but you get over it after awhile and don't mind it. He don't seem a bit like a man, if he did I wouldn't go there."

Mrs. Wary—"I should awfully like to have my India silk made there, just to try him, but John would raise the roof if I mentioned it. He's kind of pokey and old-fashioned about such matters, you know, but I would not do anything to displease him, because he is just one of the best husbands in the world. So I am going to take it to a dressmaker that makes Mrs. Frill's dresses, and they are *so* stylish. She has her rooms at the corner of 15th and Connecticut street; Schwenk, I believe, is the name. I have seen some of her work, and I like it better than any that I have seen this spring. I thought I would go to Mrs. Whiting's but I have changed my mind."

Mrs. Prim—"Why don't you stick to Mrs. Lee?"

Mrs. Wary—"Oh, I don't know. Since she made Mrs. Cleveland's dresses she seems to be different. She is getting to be just like the McDonalds used to be. They would never let you have a word to say. They would allow you to buy the goods, and that is about all. You had no say as to the shape or style; they would make it up to suit themselves, and if you objected they would speedily give you to understand that you could take it elsewhere. I don't like dressmakers after they get too prosperous."

Mrs. Prim—"I think so, too. But what a nice talk we've had. It's a wonder that horrid girl at the exchange has not shut us off before this time."

Mrs. Wary—"So it is. I've forgotten now what I called you up for, but I guess it's of no consequence, so good-bye."

Mrs. Prim—"Good-bye. I'll try and see you Sunday."—*Buffalo Times.*

Telephonic News

*** Saratoga Springs, New York, is now connected by means of the long distance telephone system, with the city of New York.

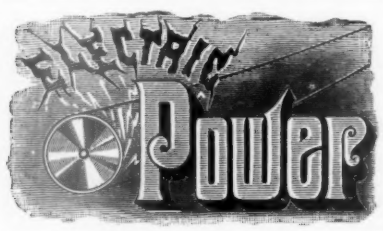
*** The Postmaster-General of England has refused to grant a license to the Writing Telegraph Company to set up exchanges. If "writing exchanges" are to be set up, he thinks they would be better under control of the government, who would arrange to buy the instruments from the makers at a fair price.

*** Says the Newark, N. J., *Daily Advertiser:* "Our Subway Commission, appointed last January, came to a focus last night, as far as organization is concerned. But it did little else than talk. The outcome of the talk was that no satisfactory system of underground wire-laying has yet been agreed upon by experts, and that more time will be needed to find some such system. In New York they are talking of compelling the electric companies to bury their wires, system or no system, by cutting down a few poles here and there. This would be a heroic remedy for an old complaint."

*** The New England Telephone and Telegraph Company has been incorporated under the laws of the State of Massachusetts with a capital of $25,000. William J. Denver is president, Fred. J. Boynton, treasurer, and the same and John W. Duxbury, C. Francis, A. Houston, directors. These gentlemen are all officers of the New England Telephone and Telegraph Company (the present company), which is incorporated under the laws of the State of New York. The new company is organized in the interest of the old company to perform certain acts and otherwise promote its interests in Massachusetts.

*** Glasgow has a system of automatic telephone call boxes. There seventy six of the boxes scattered about the city, and every subscriber has a key to them. A non-subscriber wanting to use them must first ring up the exchange and ask if the connection he desires can be made. If it can, he drops the fee, which is either three pennies or six, according to the distance he wants to talk, into a hole in the box. The pennies as they fall break a circuit and ring a bell at the central office. When the bell has rung the required number of times, the central office makes the connection. At the end of the three minutes allowed for conversation the connection is broken automatically. The average time taken to put two persons in telephonic communication in Glasgow is thirty-five seconds, in Birmingham forty, in Liverpool thirty-two and in Dundee twenty. This was ascertained from the results of ten calls in each town.

*** Superintendent Cokefair, of the telephone service for the territory of Montana, was in Butte City, recently, inaugurating a new deal for the service. He was joined during the day by General Manager Annett, of Salt Lake, who was greatly gratified at the progress made. S. M. McKee, late superintendent of construction on the Rocky Mountain lines, has been appointed local manager simply to supervise the service, he being an expert electrician. Miss Maratta will remain as chief operator, assisted during the day by Miss Moses, while Miss Maggie Grant will remain as night operator. There are now 185 subscribers to the telephone service, as against 250 in Helena; the difference between the two exchanges is the number of private residences connected with the grocery houses of Helena and a scattered population generally, as against the compact city and outside camp system of the city of Butte. At Butte a single telephone service suffices for a whole outside camp, whereas this system does not prevail in the Capital City. The new multiple system has just been put in, and will be in perfect operation in a few days.



The Hartford and Wethersfield Horse Railroad, Hartford, has been granted permission by the city council to use electricity as a motive power.

Superintendent Thomas of the Sutro Tunnel is superintending the work of cutting out a station for the electric plant in the Chollar Mine, Virginia City.

The Brooklyn City Railroad will experiment with electric motors. The Railroad Committee of the City Aldermen report favorably on the proposition.

The electric street railway of Meriden, Conn., is progressing favorably, and Manager John L. Billard now expects to have three cars running inside of two weeks.

The street Railway Company of Merrimac, Mass., made application to the selectmen to be allowed to use electricity to operate the proposed railway, and to put up the necessary poles, wires, etc.

L. L. Lewis, of the Sacramento, Cal., Electric Railway Company, has given an order for cars to the Electric Car Company of America, whose works are at Philadelphia. The cars will be 16 feet long, having storage batteries beneath the seats.

Mr. J. A. Duncan, agent of the Sprague Company, of Pittsburgh, Pa., says that the motor business there is very good indeed, and constantly increasing; he has recently installed a large number of motors, and has many more already spoken for, and in every instance they are giving complete satisfaction to the users.

A company is about to start electric works on Deer Creek, below Nevada City. The electricity there generated by water power, will be sent to such mines in Grass Valley and around Nevada City as are not in reach of water power. Several mining companies are reported to have agreed to take the electricity for working their mines.

The Thompson-Houston Electric Light Company has bought the Hoosac Valley Street Railway, running from North Adams, N. Y., to Adams. The purchasers paid $75,000. A plant costing $50,000 will be erected to run the road by electricity. There is also talk of an electric railway between North Adams and Williamstown.

The eighth of the large welding furnaces composing the lap-weld department of the National Tube Works Co., at McKeesport, Pa., has been put into operation. One more furnace makes up the mill, but it is being modeled for electric welding. These furnaces have been increasing their products for months back, until to-day the average output of 24 hours can be placed at 85 tons each, to 40 tons of a year ago.

The Sprague Electric Railway and Motor Company have received an order from the U. S. Government for motors for use in the service, and an installation is to be made at once on board the U. S. steel cruiser, "Chicago," of motors to be used in the training and elevation of the guns. The electrical and mechanical apparatus required for this work will have to be of the most delicate and perfect construction, and the Sprague Company is well equipped for the work.

Of the many instances of the superiority in the economy, reliability and cost of maintenance of electric power, one of the most satisfactory is the experience of Mr. L. J. Wells, of 113 Fourth street, Des Moines, Iowa, who says: "I have been using a 3 horse-power Sprague electric motor for nearly three years, running elevator hay hoist, pump, horse cleaners and ventilating fan. It has not cost me one cent for repairs, and saves me at least six hundred dollars a year."

The electric machinery for the Big Bend Tunnel is being put up. It comprises two dynamos, 12 motors, 50,000 pounds of copper wire. The dynamos have a capacity of 140 horse-power, and the motors five horse-power each. There are two lines of copper wire, one seven miles long and the other ten, and as each is double, this makes about 34 miles of wire. The electric power will be used to run the pumps and derricks. The plant was furnished by the Sprague Electric Railway and Motor Company, of New York city.

The Thomson-Houston Motor.

The accompanying engraving illustrates one of the many uses to which the electric motor has been applied, and to a class of work which is receiving daily more and more attention. The motor as shown in the cut, was installed by the Thomson-Houston Electric Company about the middle of February, 1888, at the agricultural implement warehouse of Bartlett & Dow, Lowell, Mass., and since that time has been in operation.

That its advantages are fully appreciated, and that it has done all that was claimed for it, is clearly shown in the accompanying letter:

LOWELL, MASS, May 21st, 1888.
THOMSON-HOUSTON ELECTRIC CO:

Replying to yours of the 19th inst., we would say that we like our motor purchased of you very much. It has run our elevator (which you know is a large one, nine feet by five feet platform), perfectly for three months now, and has never failed to do all that we have asked it to do, and that is a good deal more than you warranted. We see no reason why it will not continue to do so for a long time, and with less care and trouble than we expected. We are very much pleased with it, and could not ask for anything better. Very truly,

(Signed.) BARTLETT & DOW.

The Thomson-Houston motor has also been used to a great extent for passenger elevators, and that it is as successful in this direction as for freight elevators, is fully attested by the following letter.

WASHINGTON, D. C., May 19th, 1888.
MR. C. M. MCNETT, Special Agent, Thomson-Houston Electric Co.:

I have examined your electric motor, now used in running the elevator in the Central National Bank of this city, and I take pleasure in saying that I have never witnessed better results from power than this motor is developing, being perfectly steady without noise or disagreable odor, which is an objection to other devices furnishing power. I saw the motor subjected to some severe tests in starting it with the whole load on, also tests which fully convinced me that it is all that is required for power purposes.

Yours respectfully,

(Signed.) H. S. YERGER.

This is but one of the many applications of power which can be made with this motor. It has been found to perform its work equally as well wherever used, as it has in these two instances, and all who have used it are loud in praise of its efficiency and excellence in all particulars which go to make up a superior machine.

The New Battery of the Electric Gas Lighting Company of Boston.

The "Samson" is the name of this new primary battery, illustrated on this page, which the Boston company above mentioned has the exclusive right to handle in the United States. The carbon cup is manufactured in Paris, patented in Europe, and patents applied for in this country. The Elec-

tric Gas Lighting Company tested the battery for nine months and were greatly astonished and pleased with the results.

Prof. A. E. Dolbear, of Tuft's College, in his report of a test of the "Samson," speaks very highly of it, and says: "It appears therefore that the Samson cells are much more energetic than the ones they were compared with; so much so, that one of them is about as good as two of the latter kind for such service as the production of strong currents or strong magnetic effects. The device of making the carbon cylindrical and fluted enables them to contain a large quantity of the binoxide of manganese, and presents a large surface to the solution. The shape of the zinc and its proximity to carbon is another advantage for such work. I have also tested the cells for telephone work and find them very superior. Their small internal resistance enables them to give a stronger current through the induction coil than any Leclanché cell I have ever tested before. This amounts to 25 or 30 per cent. The cell meets my commendation."

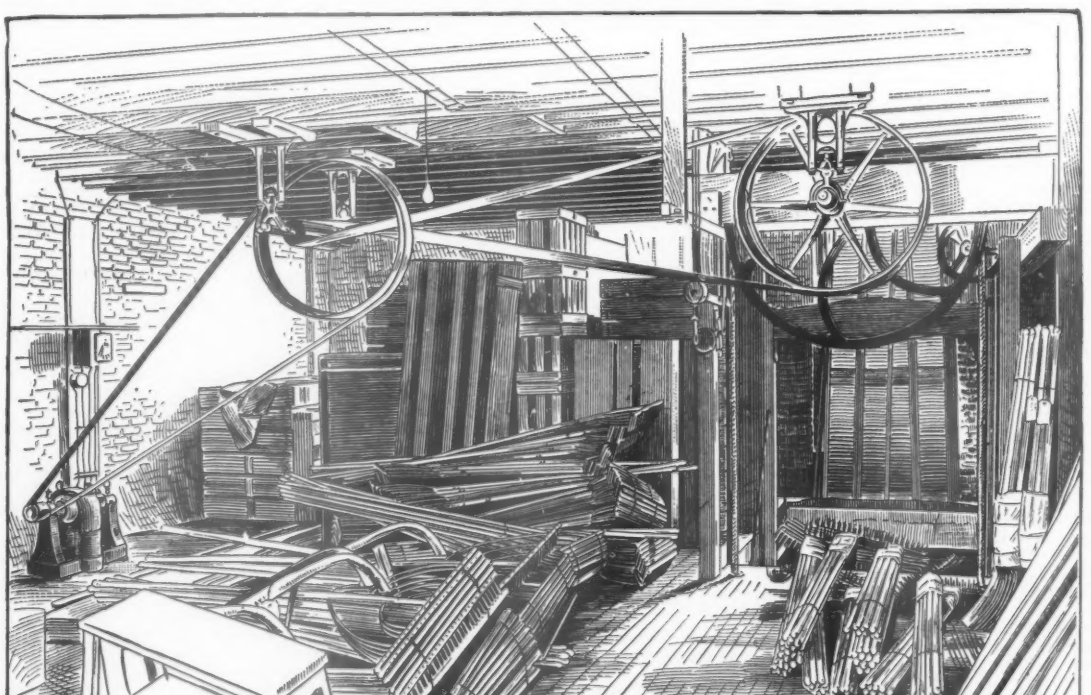
President Strong Interviewed on the Wire Question.

President William L. Strong of the Brush Electric Illuminating Company is reported in the *Herald* as saying that there were thousands of miles of dead wire in this city that ought to be taken down. It would be impossible to say just how many miles there were, but he had heard estimates of competent men that placed their length at ten thousand miles. Most of these wires had been abandoned by telegraph and telephone companies when they partially adopted the underground system, and were not cared for by anybody.

"To show you that our company are ready and willing to comply with the law I mention that we were about to sign a contract on November 1 last for a nine wire cable, which we intended to lay in the conduit along Broadway, from Fourteenth street to Thirty-fifth street. The makers were to guarantee the wire for five years, and were to give a bond to that effect. They asked time to examine the conduit, and when they had done so they came to us—five days later—and withdrew their guarantee. I am not at liberty to tell you why they withdrew it, but you can draw your own deductions. After this refusal we made an investigation on our own account and found that even if we had laid the wires we could not have made house connections without extra expenses that would soon have bankrupted us.

"At present it costs us $50 a mile to maintain our wires. Under the conduit system it would cost us $1,800, or perhaps $2,800 a mile. In the first place, we would have to pay $850 a mile for the privilege of using two and a half inches of space in the main conduit, and $1,000 a mile for what is termed the 'subsidiary' conduit. If we had houses on both sides of the street our rental would be $2,800 a mile. Our company has 240 miles of wire upon poles. If these were put into conduits the mileage would probably be reduced to 120 miles, but even then the maintenance of our wires would cost us $201,250 more every year than it does now if we were to use only one side of the street, and double that amount if we were to use both sides.

"When the Governor heard arguments for and against the bill directing the wires to be put under ground the advocates of the measure urged that the passage of the law would not put the companies to any greater expense for the maintenance of their wires than they now sustain. This, if I remember rightly, was one of the chief arguments advanced. Now, as I have shown you by the expenses, should the system devised by the Board be adopted, there is not a company in the city that will not be forced to suspend or to go into bankruptcy. Just see the contrast between $50 a mile and $1,800 or $2,800 a mile!



THE ELECTRIC MOTOR IN AN AGRICULTURAL IMPLEMENT WAREHOUSE.

"Ever since the underground system was broached we have been experimenting with the object of finding some means of insulating the wires that would enable them to resist the influences of the moisture and the gas that permeate the earth. At our plant on Elizabeth street we have buried wires in all sorts of insulating material along a distance of one hundred feet or more and have worked them just as we work our commercial wires. We have tried iron, lead, asphalt and everything else that we could think, but the result has always been a dismal failure.

"Once I thought that an iron pipe lined with glass, which the inventor showed me, would answer the purpose perfectly. So thoroughly was I convinced of its practicability that I purchased a controlling interest in the patent. Well, I had it laid in our experimenting ground on Elizabeth street, and for a time it worked to our entire satisfaction. But this did not last long. In exactly forty-four days we found that it was utterly worthless. Our experiments cost us in the neighborhood of $3,000, and only served to show us that thus far there is no process that renders underground insulation absolutely certain."

The Baldwin Gas Engine.

The Baldwin gas engine is extremely simple in construction, neither slide valve nor eccentric rods being employed, and the valves being automatic. The mixture of gas and air is ignited by electricity, a small electric generator being employed for that purpose mounted upon the engine, an explosion taking place at every revolution. When used for driving dynamos, however, the igniting spark is taken from the electric current that supplies the lamps.

The bed of the engine is a hollow case. In the bed is a casing which has seats for valves, covering the ports, and this casing communicates through a pipe with a casing formed by the bed of the engine, upon which the cylinder rests. The casings and tube constitute a reservoir, into which gas and air are admitted, the air entering the port and flowing over a perforated plate.

The air and gas are drawn unto the reservoir by the backward movement of the piston, the mixture flowing into the reservoir, and through two ports into the cylinder. On the forward movement of the piston the valves in the reservoir close, and the mixture is compressed in the reservoir.

The head of the cylinder contains a chamber which communicates with a channel in the cylinder, leading to a port between the channel and the reservoir, and the chamber communicates also with a central port in the end of the cylinder, which end has a concave face, and opposite this face is a retarder or "hold-back"; it also acts, among other things, to direct the products of each explosion toward the center of the cylinder, instead of laterally toward the periphery of the retarder and into the space between it and the cylinder head at the back end of the cylinder.

A valve closes the port, and is held down by a spring that bears on the valve-case and on a hollow nut on the valve-stem, and when the valve is raised the mixture compressed by the forward movement of the piston in the reservoir flows out through the port into the cylinder. The valve rises automatically whenever the exhaust is open, so that the pressure in the reservoir exceeds that in the cylinder.

Near its center the cylinder, at the lower side, in a line between the ports, communicates with a transverse exhaust pipe, and when the piston, by the explosion of the gaseous charge, is forced forward beyond said ports, it is uncovered and opened for the escape of the spent gases and, at the same time, the valve is lifted for the entrance of a new charge, so that the latter flows under pressure and aids to drive forward the old spent charge, which flows out at the exhaust. The retarder holds back the new charge, and prevents its mixing with the old charge, and thus escaping before it is burned.

The piston when it moves back covers the exhaust port, thus avoiding all valve packing. By placing the port at the bottom of the cylinder, it tends to pack more closely to the face than when placed at the side.

It has been found that by the use of a mixture of the highest explosive quality—that is, a mixture which will explode most rapidly or violently—all parts of the entire volume ignite instantaneously, and the most economical and effective results are secured. The inlets for gas and air are, therefore, so proportioned as to maintain generally in the reservoir a mixture of the highest explosive effect. As, however, it is necessary to vary the force of the explosions in proportion to the work to be done, this result is secured by varying the charges or volumes of mixture admitted to the cylinder. The inlet valve is, therefore, lifted to a greater extent or held up for a longer time when the charge is to be increased, and is lifted to a less extent or for a shorter time if the charge is to be decreased. This variation in the lift of the valve is effected by introducing a curved and slotted wedge. The valve is lifted by the pressure of the mixture in the reservoir, as before described, the wedge limiting the upward movement, the spring closing the valve when the pressure in the cylinder is about equal to that in the reservoir. The wedge is moved automatically by a regulator, so as to increase the volume of the charge if the engine begins to run too slowly, or decrease it if the engine runs too fast.

While the variation of the volumes of the highly explosive mixture will regulate the engine when operating under different resistances, the use of such a mixture when the engine is running free and doing little or no work would be wasteful, and it would be difficult to sufficiently decrease the speed. Means are, therefore, provided for reducing the strength in mixture in such cases by decreasing for the time being the quantity of gas in the mixture, and this decrease is automatically effected by means of the same regulator that controls the action of the valve.

Bidding for Light in Milwaukee.

The Board of Public Works, Milwaukee, has opened the following bids for lighting:

The Milwaukee Gaslight Company offered to light 2,000 lamps at $26.08 each for five-foot burners, and $29.89 for six-foot burners.

The Badger Illuminating Company wanted $150 per year for lamps of 2,000 candle-power in overground districts, and $175 in underground districts. They would furnish 1,200 candle-power lamps at $115 per year.

The Northwestern Electrical Construction and Supply Company offered to furnish 2,000 candle-light power lamps at $130 per lamp per annum.

The bids will be referred to the Common Council, which will let the contract. It is expected that the matter will be savagely fought in the Council, as it is the first serious attempt to break the monopoly enjoyed by the gaslight company for years. The contract is for five years.

——The *Popular Science Monthly* describes a curious and ingenious device called "The Echo Maker" to be used on ships at sea. A flaring funnel is screwed to the muzzle of a rifle. When a supposed obstacle is near the vessel, the rifle is fired in its direction, and if the obstacle is there the beam of sound projected through the funnel strikes the obstacle and rebounds, and as the echo is more or less perfect in proportion as the obstacle is more or less parallel to the ship from which the gun is fired, and as it is near or remote, the position of the obstacle may be inferred. The inventor claims that a sharp sound projected at or nearly at an object, and only when so directed, will in every case return some of the sound sent, so that theoretically, there will always be an echo, and the difference in the time between the sound sent and the echo will indicate the remoteness of the object. The Naval Board tried the echo maker and found that a return sound could be heard from the side of a fort half a mile away from passing steamers a quarter of a mile off if broadside to; from bluffs and sails of vessels at about the same distance, and from spar buoys 200 yards away.

——Of that vast work, as projected, the ship canal between Bordeaux on the Atlantic seabord, and Narbonne on the Mediterranean coast, it is stated that the cost will be some $130,000,000, and while its length would be about 330 miles the use of it would be a saving of nearly 700 miles by vessels going from southern France or northern Italy to the northern Atlantic. The plan, it is said, contemplates having a railroad run along the margin of the canal, and using locomotives to tow the vessels through, by which means, it is believed, a speed of seven miles an hour may be maintained both day and night, as during the hours of darkness the canal might be illuminated with electric lights. There would be, according to the plan, thirty-eight locks in the canal, and the depth of water, twenty-seven feet, would permit French armor clad vessels to pass through the canal, thus uniting the two sea coasts of the country, and avoiding the passage through the Strait of Gibraltar, which might in the time of war be blocaded by the fleet of an enemy, and would deprive the English of certain advantages which they now have in the Gibraltar fortifications. It is thought that, for commercial purposes, the patronage of the canal will be sufficient to pay a good return on the money invested in its construction.

—— The cotton seed oil mill of Atlanta, Ga., owned by the American Cotton Oil Trust, is introducing electric light for the better lighting of their mill.

—— The Coroner's jury has concluded the inquest in the case of lineman Thomas Murray, of the Brush Illuminating Company, of this city, and finds that the lineman's death was caused by negligence on the part of the company. The jury also recommends that the Coroner "call the attention of the District Attorney to the illegal maintenance of wires above ground in this city."

—— The Citizens' Electric Light Company, Evansville, Ind, has been organized and will put in the Westinghouse incandescent system. The gentlemen interested, are Geo. Warren, U. W. Armstrong, G. J. Grammar, J. E. Williamson, E. B. Morgan, Geo. Brose, Jno. F. Kuhn, T. H. Odell, Azro Dyer, W. J. Lewis, Chas. R. Bement, J. W. Lauer, G. M. Daussman, L. M. Rice, Chas. Laval.

—— The Electric Light Company of Atlantic City, N. J., has just closed a contract with the Philadelphia agent of the American Electric Construction Company, Limited, for two more fifty light machines and one hundred lamps of the American system. They also purchased an additional Armington-Sims engine; size, 14x131. This company has been awarded the contract by the Atlantic City Council for all-night lights the year around, the lamps to be placed on each cross street of Atlantic avenue.

—— The illumination of the great hall in the St. Louis Exposition building, which is being fitted up for the reception of 16,000 persons during the coming festival of the American Saengerbund, will be furnished by the Heisler system. The managers of the Exposition have decided not to employ any other lights. The isolated plant, which is located in the building, not being sufficiently large for the purpose, the Heisler system has been called upon to furnish about 600 lights of 30 candle-power for the illumination of the main parts of the hall, and it is expected that the effect will be suitable for the occasion.

—— The Woman's Reformatory Prison at Sherborne, Mass., is to have an electric light plant, and the contract has been awarded to Messrs. Claflin & Kimball, N. E. agents for the Mather Electric Company, for 320 incandescent lights, and they will begin work on the plant at once. This makes the second State institution lighted by electricity, the other being the State Almshouse, Tewksbury, Mass., of 500 lights, which was also awarded to the Mather Company, and has given perfect satisfaction from the day of starting, being highly spoken of by those connected with it.

In addition to the above, the new steam yacht of Mr. Geo. Fabyan, being built at East Boston, will be lighted by a 50-light plant of the Mather system.

—— An interesting account of the electric plant at Austin, Texas, appears in the *Daily Dispatch* of that city, in which well-merited praise is given Captain M. D. Mather, the leading man in the enterprise. After describing the engines, the article says; "Ranging on line with these engines, and placed a few feet in advance of them, are six dynamos and three exciters. Three of these dynamos are of the Brush arc design—two of 30 lights each, and one of 60 lights, the three furnishing 120 arc lights of 2,000 candle-power each. The remaining three dynamos are of the Westinghouse incandescent system—one of 1,300 lights, and two of 650 lights each, or a combined capacity of 2,600 incandescent lights of 16 candle-power each. Dynamos as well as exciters rest upon solid foundations of six-foot masonry, and act independently of each other or combined. Foundations have been prepared for an additional 100 horse-power engine of the Ball manufacture, and a Westinghouse dynamo of 1,300 incandescent lights. Captain Mather leaves in a few days for the east, to hasten the shipment of both, which were ordered some weeks ago."

ELECTRIC LIGHT NEWS

—— The town of Allegan, Mich., is shortly to be lighted by electricity.

—— Mr. Osborne is putting up a 60 arc electric light plant at Benicia, Cal.

—— Electric lights are now used by most business houses and stores at Kalkaska, Mich.

—— The new electric beacon light on the south end of Goat Island, Rhode Island, is in operation.

—— The Town Council of Belding, Mich. are taking steps to have the town lighted by electricity.

—— The Common Council of Orange, N. J., are asking for bids for lighting the public streets.

—— The University of Tuskaloosa, Ala., is negotiating for electric light machinery for their buildings.

—— Samuel H. Taylor is the general agent for the Thomson-Houston electric system in San Francisco.

—— The Markham House, Atlanta, Ga., is to have an electric light incandescent plant with a capacity of 400 lamps.

—— F. G. Berry of Fresno, Cal., will erect an electric plant for lighting the Grand Central Hotel, San Francisco.

—— The Town Council of Suffolk, Va., wants proposals for lighting the public streets, etc., of that city by electricity.

—— The Electric Power Company of San Francisco, Cal., are enlarging their plant. A 200 horse-power Corliss engine has been put in.

—— The Hendrick Machine Ice Company of Los Angeles, Cal., have purchased a 50 light incandescent plant of the Thomson-Houston Company.

—— The Electric Light Co., Taunton, Mass., has declared a six per cent. dividend and voted to add $10,000 to its capital, making it $30,000.

—— The electric light company of Dallas, Tex., has changed hands. A new plant will be put in and $40,000 invested to make the enterprise a success.

—— The supervisors of the town of Santa Clara, Cal., have granted a ten years' franchise to the Electric Improvement Company of San Francisco, for street lighting.

—— The proprietors of the Baldwin Hotel, San Francisco, Cal., have made a contract with the Westinghouse Company to put a 650 incandescent electric light plant in the hotel.

—— Omaha is to have a new electric lighting company. G. Pantaleoni, of the Westinghouse Electric Light Company, of Pittsburgh, Penn., is in the city completing arrangements for putting in a large plant.

—— W. C. Harris, Jr., southern manager of the Waterhouse Electric Company, has contracted to place electric lights in Shetta Rock cave, near Huntsville, Ala. The cave is said to be very attractive.

—— Gov. Hill of New York has signed the bill which substitutes electricity for hanging in capital cases after Jan. 1, 1889. A very limited number is allowed to be present. Relatives have the first claim upon the body, but no unusual demonstrations shall be made at the funeral.

—— The citizens of the Third ward, Topeka, Kansas, are petitioning the council for additional Brush lights to be placed in that portion of the city. Topeka is one of the most beautiful and rapidly growing cities of the west, and the citizens are displaying the proper spirit in endeavoring to have the streets well lighted.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 5, 1888.

383,857 Governor for electro-magnetic motors; Chas. F. Brush, Cleveland, Ohio.
383,863 Magnetic separator; Gurdon Conkling, Glens Falls, N. Y.
383,891 Cut-out for incandescent lamps; Hermann Lemp and Merle J. Wightman, Hartford, Conn.
383,899 Electro therapeutic battery; Edward J. Murphy and John Floyd, Lynchburg, Va.
383,901 Electric power controller; Gustave S. New, New York, N. Y.
383,913 Rheostat; E. Wilbur Rice, Jr., Lynn, Mass.
383,918 Magnetic separator; Michael H. Smith, Halifax, County of York, England.
383,919 Insulated wire; Henry Splitdorf, New York, N. Y., assignor to the Splitdorf Wire Company, same place.
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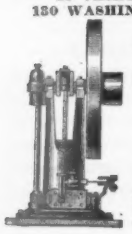

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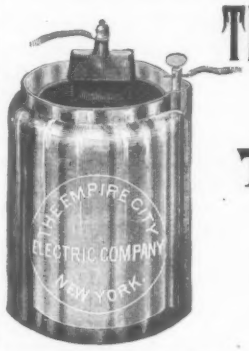

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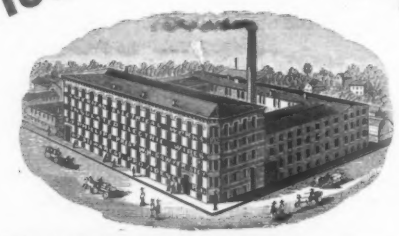

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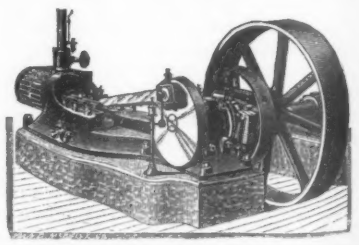

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